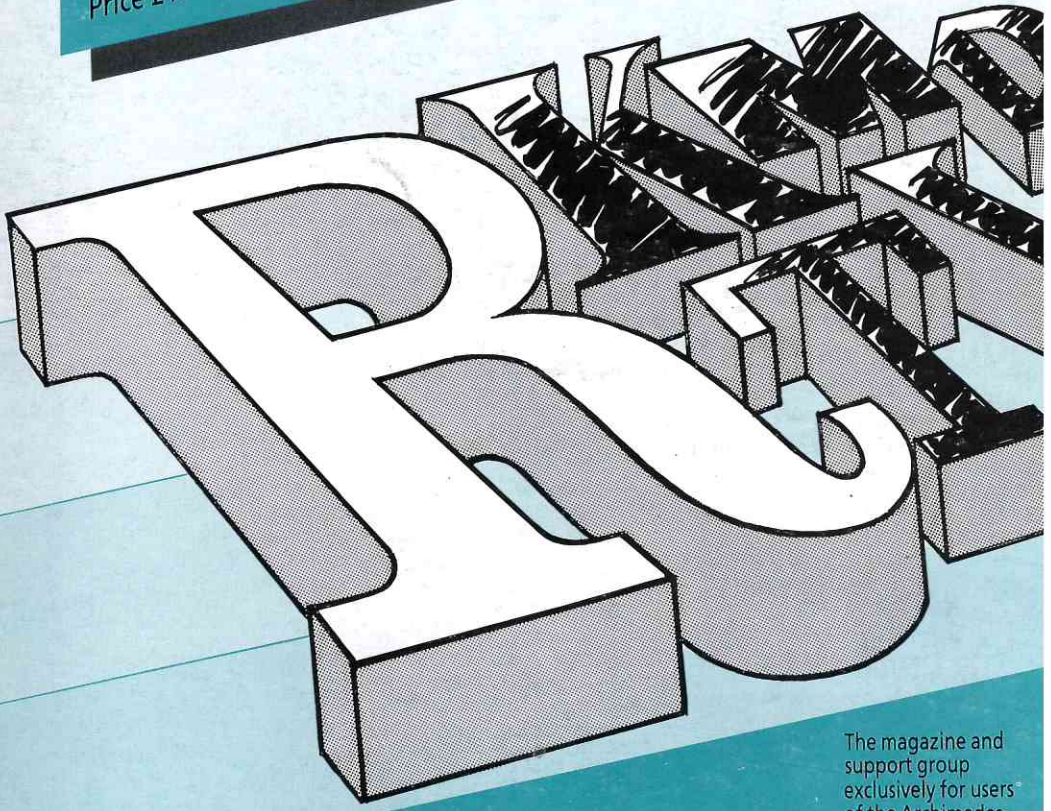
Volume 3
Issue 3

RISC USER

JANUARY/FEBRUARY 1990
Price £1.60

- Filetype Setter
- System Fonts
- SCSI Interfaces
- Sound Module Generator



Outline Fonts

The magazine and support group exclusively for users of the Archimedes

ISSUE 3
VOLUME 3
JANUARY/FEBRUARY 1990

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RISC USER

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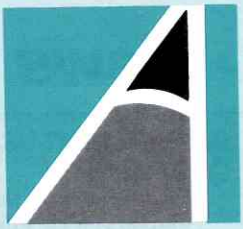
EDITORIAL



Welcome to the first issue of RISC User for the nineteen nineties. As you will have seen, unless you only recently joined RISC User, we introduced a new look for RISC User from the start of volume 3, which we hope will make the magazine more attractive and easier to read.

However, the value of RISC User, as with any magazine, lies in its content rather than its presentation, although poor style will, of course, fail to do justice to good content, and indeed may detract from it. As many readers will know, we carried out an extensive reader survey in the middle of last year, and the content of RISC User has undergone a number of changes as a result.

The magazine has grown significantly in size over the last 12 months, allowing us not only to include more editorial material than before, but also to cater better for specialist interests as well. However, RISC User caters for a wide and varied readership, so do remember this if we do not always devote as much space as you might wish to your pet interest.

A reader survey, however useful and comprehensive, can only attempt to convey the opinions of readers at one point in time. Acorn, and other suppliers, will certainly not stand still, and we can no doubt expect some exciting developments during this year. The mix of Archimedes owners likewise does not remain the same. Already it is becoming clear that many early Archimedes purchasers were previously BBC owners; more recently the success of the Archimedes range has attracted a wider range of new purchasers.

This has been very obvious to us in conversations which we have had at our two open days, where we have very much enjoyed the opportunity of meeting and talking both with existing readers and potential readers for the future.

If RISC User is to continue to satisfy the needs of Archimedes owners, then we still very much need to listen to your views, not only on the magazine, its presentation and content, but on any matters related to the Archimedes. We hope that in the forthcoming months you will continue to let us know what you think, by letter or by phone. Of course, if you can contribute in other ways, such as questions for our Technical Queries page, hints & tips, programs, articles or anything else related to the Archimedes and its use, then we would be equally delighted to hear from you.

NEW STAFF

Back in the October issue (Volume 2 issue 10) we referred to the departure of our then Technical Editor, David Spencer, to a new position in charge of hardware development within BEEBUG. We are now delighted to welcome Alan Wrigley to the team as our new Technical Editor.

MISSING PAGES

As a final footnote, it appears that the Programmer's Reference Manual is missing pages 130, 132 and 134 (and three pages are duplicated). Acorn says that the omission will be rectified in future editions, but has kindly made the missing information available in machine readable form for the monthly magazine disc (see inside back cover). We can also supply a photocopy of the missing pages in return for 50p (to cover costs) and an A5 or larger SAE. Please mark your request PRM Pages.

• News • News • News • News •

BEEBUG/RISC USER SUMMER COMPETITION

The winner of our Summer Competition, Paul Warren, and his wife visited BEEBUG before Christmas when Paul was able to collect his prize of an A3000 colour system donated by Acorn. Paul, who has an issue 3 model B BBC micro, was highly delighted at his good fortune, and was looking forward to an increased interest in home computing with his new system. Paul claims no great mathematical ability, but says that once he started on the competition, he just became 'hooked'. Our congratulations to Paul.

ACORN NEWS

As well as being distributed through Dixons' 'flagship' high street stores, the A3000 is now available through ten of the leading stores in the John Lewis Partnership, and through four Adlers stores. This should further widen the appeal of the A3000 with the general public.

A special discount offer has been announced by Acorn on complete R140 (UNIX) systems. For £2999 (plus VAT) Acorn is bundling an R140 RISC-based workstation with hard disc and Ethernet networking, plus a choice of either PC emulator software and 14" Taxan colour monitor, or a 19" Taxan monochrome monitor.

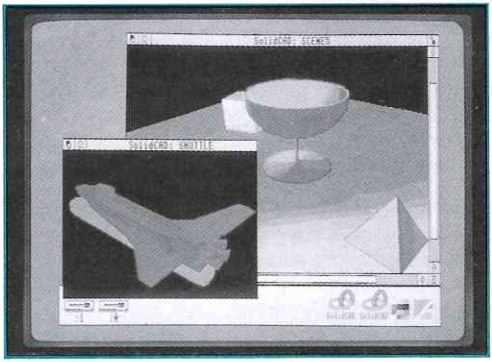
For more information on Acorn products contact Acorn Computers Ltd. at Fulbourn Road, Cambridge CB1 4JN, tel. (0223) 245200.

NEW RELEASES FROM SILICON VISION

Silicon Vision has announced RISC OS versions of many of its software products: SolidCAD Design System (£99.95), Realtime Solids Modeller (£149.95), with upgrades costing £50.00 for existing users (prices include VAT).

A new product in the CAD marketplace is SolidTools, a fully integrated environment for 3D CAD, photo-realistic rendering, interactive animation with high-resolution hard copy to printers and plotters. This combines the features of previously separate products, SolidCAD, SolidsRender and FilmMaker. The price of SolidTools has been set at £275 (inc. VAT).

For PCB design, Silicon Vision has introduced GerberPlot to complement its existing Arc-PCB and Arc-PCB Professional products. The new software allows industry standard gerber plot files to be produced, which may be sent to photoplotter bureaux for high quality PCB artwork. GerberPlot costs £125 (again inc. VAT).



Silicon Vision's RISC OS version of Solid CAD

For business users Silicon Vision has announced a RISC OS version of its business software, Presentation System (£49.95), and new office automation products: DataVision (£99.95), Financial Accountant (£175.00), and ShareHolder (£99.95). The complete suite of programs is also available as a single system called OfficeTools and costing £295.00 (all prices inclusive of VAT).

Silicon Vision may be contacted at Signal House, Lyon Road, Harrow, Middx HA1 2AG, tel. 01-422 2274.(*)

DIGITISER FROM PINEAPPLE

The latest digitiser for the Archimedes comes from Pineapple Software, well known for its CAD and PCB Design software. The new device is a full colour Video Digitiser/Frame Grabber at just £327.75 inc. VAT. An extended (16 bit storage as opposed to 12 bit) will be available for 362.25 (inc. VAT). Pineapple claims that the low price in no way indicates poor design or quality. The PAL decoder at the heart of the device converts a coded signal from a VCR, TV tuner or camera etc. into the RGB components, and is a high quality design with both luminance and chrominance delay lines to ensure the highest quality decoding.

The new device is expected to be available shortly, and orders are already being taken. Pineapple Software is at 39 Brownlea Gardens, Seven Kings, Ilford, Essex IG3 9NL, tel. 01-599 1476.

NEW ARCHIMEDES ROM FROM ACORN

Acorn is believed to be working on a new 1Mbyte version of the RISC OS chip set (currently 0.5Mbytes) which will incorporate applications such as Draw, Edit, Paint and possibly the Basic Editor, presently supplied on the Applications Discs, and even cached fonts and C libraries What is more, these applications then run from the ROM, leaving many hundreds of K of RAM free. Users of 1Mbyte machines in particular will then find it much easier to use these applications, particularly when multi-tasking, and being ROM rather than disc based, will be immediately available at all times. Unfortunately, the new ROM is only likely to work with the 400/1 series (and A3000).

Availability is some months away, but we believe that Acorn will be offering the new chip set to existing owners as an upgrade.

ALL ARMS

Another source of ARM3 upgrades for the Archimedes has become available. Gnome Computers of Cambridge, better known perhaps for its range of Transputer products for the Archimedes, has released an ARM3 board at £569.25 inc. VAT, undercutting the ARM3 upgrade currently offered by Aleph One (see review in RISC User Volume 2 Issue 10).

Gnome has also released a 4Mbyte to 8Mbyte upgrade for the 440/1 at £1092.50 inc. VAT. This will also benefit the R140 UNIX workstation running X Windows. For more details contact Gnome Computers at 16 Histon Road, Cambridge CB4 3LE, tel. (0223) 461520.

RISC USER READERS IMPRESS ACORN

In addition to BEEBUG's own competition (see above) RISC User distributed a questionnaire from Acorn last year to help Acorn identify particularly interesting and significant applications involving the Archimedes. Acorn offered an Archimedes 410 colour system for the most interesting entry, and £300 worth of software in a prize draw.

In fact, Acorn was so impressed with the standard of entries from RISC User readers that it decided to award two 410 colour systems as prizes. The fortunate winners are Mark Shacklady with an impressive process control application and Alan Brian with a CAD and process plant display and control application. Both have been invited to BEEBUG this month to receive their prizes from Acorn. The winner of the prize draw was Mr.Delaney of Stalmine, near Blackpool, who has already received £300 worth of vouchers to be exchanged for the software of his choice.

PRM REPRINTED

It is now known that Acorn terminated the initial print run of the Programmer's Reference Manual after just 1200 had been printed because of poor reproduction quality. We understand that the manuals have been re-originated to a higher standard, and that the new copies were printed just too late to be dispatched before Christmas. Acorn also took the opportunity to include three pages previously missing (see this month's editorial) and to make a few other minor corrections. Acorn details are given above. (*)

SCHOOL IS FUN

Database Educational Software has announced that its best selling educational package Fun School 2 (with 60,000 units already sold) is to be released for the Archimedes, and in this format offers superior sound and graphics to any other version. Fun School 2 is available in three versions, one for the under sixes, one for six to eight year olds, and a third for the over eights.

Fun School 2 combines entertainment and education to develop skills in numeracy, literacy and concentration, and all now in a wholly Archimedes environment.

For more information on Fun School 2 contact Database Educational Software at Europa House, Adlington Park, Adlington, Macclesfield SK10 4NP, or tel. (0625) 878888.

All products mentioned which are marked with a '*' are available direct through BEEBUG Retail (see Retail Catalogue). RU

ARE YOU GOOD ENOUGH?

As the leaders in software for the Archimedes range of computers, CLARES MICRO SUPPLIES are looking to extend our range even further. We are looking for people who are as excited by the Archimedes as we are.

If you have written any programs, completed or not, then we would like to hear from you.

If you have any ideas for programs and have the ability to execute the ideas then we want to hear from you.

If you have the ability to program the Archimedes but not the ideas to program then we want to hear from you.

Programs can be written in any language as long as they perform their stated task. Many of our programs contain large chunks of BASIC with ARM code in the areas that it is needed. BASIC on the Archimedes is a very powerful language and we do not attach any snob value to its use. If your program does what is meant to do then thats all we are interested in. Why not join the top team on the Archimedes. You get the support of our in-house team, privileged access through us to Acorn and invitations to our informal programmers seminars.

The most important point is that you will be earning top royalty rates of if you prefer we will purchase your program outright.

Please write, in confidence, to Mr. D. Clare at:

Clares Micro Supplies,
98 Middlewich Road,
Northwich,
CHESHIRE CW9 7DA

If you have a program either complete or in development then please enclose a copy for our evaluation.

To protect yourself we advise that you lodge a copy of the program with your bank or solicitor BEFORE you send us a copy. You can then prove that your program pre-dates anything that we have.

Act today and become part of the leading software team producing software for the worlds fastest micro.

SCSI Interfaces
- an alternative approach to hard discs

by Mike Williams

More observant readers may well have noticed references in RISC User and other magazines to the term SCSI, particularly in connection with larger capacity hard disc drives. In this report, it is our intention to explain what SCSI is, the significance it has for Archimedes owners, and to look at the SCSI products currently available from two suppliers, Lingenuity and Oak Computers.

INTRODUCING SCSI

SCSI (Small Computer Systems Interface) is a high speed industry-standard interface which allows as many as 7 (possibly different) devices to be connected to a computer through the one interface. Each SCSI device has a unique identity by which it can be recognised, and several SCSI devices are simply daisy-chained together, each device having a SCSI 'input' and a SCSI 'output'.

The SCSI standard is not specific to the Archimedes, and has quite a long history of use, particularly with the Apple Macintosh. Typical devices which might be connected to a SCSI interface include Winchester hard disc drives, tape streamers, CD ROM units and other devices needing high speed throughput.

A SCSI interface uses an eight bit data bus to transfer data to the device connected to it, with a maximum transfer rate of 2Mbytes/sec. In practice, SCSI devices often operate at lower rates, typically some 650Kbytes/sec for a hard disc drive, for example. A further factor is the speed at which the host system can transmit or accept data to or from the SCSI interface.

SCSI AND THE ARCHIMEDES

A SCSI interface fitted to an Archimedes (and that includes the A3000) allows a variety of high speed, high capacity devices to be connected. At present, the devices available are exclusively hard disc drives, although both Lingenuity and Oak say they will have other devices available shortly. In this report we are concerned only with hard disc drives.

For the Archimedes range, a SCSI interface allows a higher capacity drive to be used than is otherwise possible. The Archimedes normally uses a standard ST506 controller for hard disc drives. This permits a maximum capacity of 47Mbytes per drive. SCSI allows hard disc drives of up to 512Mbytes capacity each.

SCSI hard discs have an inherent speed advantage over ST506 drives, but in practice the improvements depend on the drive being used (and the screen mode in use - see later). A worst case comparison still offers a two times improvement, while at best SCSI drives may be nearly 40 times faster than those using the ST506 controller.

SCSI drives do not use the ADFS but an on-board SCSIFS. This is functionally identical (in both Lingenuity and Oak versions) to the ADFS. A further point of difference (and debate) concerns the width of the data bus connecting the SCSI interface to the Archimedes. The Lingenuity SCSI interface uses an 8 bit data bus, while that from Oak doubles up the bytes and uses one 16 bits wide. The Oak interface can therefore transfer twice as much data on each memory access, and is thus intrinsically faster, but again the speed of the SCSI device may be the more limiting factor.

This point also relates to the screen mode in use when a transfer takes place. As higher resolution modes take more memory, they also take longer for screen refreshes, reducing the time for other data transfers. In mode 21 for example, the ability of the Oak interface to send 16 bits at a time starts to have a major beneficial effect on timing relative to the Lingenuity board. In modes such as 12 and 15 the difference is much less marked.

THE INTERFACES REVIEWED

Both Lingenuity and Oak only supplied Archimedes (not A3000) interfaces for review purposes. Both interface boards use the same

(though non standard) connector for linking to a hard drive. This is fine if you buy your drive at the same time, but check if you are obtaining your drive separately. Both interfaces are made to a high standard and feature the same controller chip. The Oak board has more components as befits its use of a 16 bit data bus.

In practice, installing an interface and connecting it to a hard drive is quite straightforward, though care is needed. Once an interface has been fitted to the Archimedes, a 50 way ribbon cable then connects interface to drive. Disc drives may be internal or external, but the latter incorporate a separate power supply and are hence more expensive. Internal drives involve slightly more work in the fitting. Both Lingenuity and Oak supplied external drives for testing.

As far as the A3000 is concerned, the policies of Lingenuity and Oak differ. Oak supply the same SCSI interface mounted in a metal case which is attached to the connector at the left rear of the A3000. Lingenuity supplies a different SCSI card which can be mounted internally, with the SCSI connector flush with the rear of the machine, a generally neater solution. The A3000 has no room for an internal hard disc, and so an external unit must be used with both interfaces.

The Oak system is supplied ready configured, so once installed and switched on, the hard disc icon immediately appears on the icon bar. With Lingenuity's interfaces, the system must first be configured before the SCSI icon appears, a straightforward task which is clearly described in the documentation.

TIMING

A number of typical timings are shown in table 1. The main difficulty here is in comparing like with like. In addition, timings are not constant from any one test even when averaged out. The specific transfer rate of the drive model selected also has an affect. The general impression from our own tests, and from figures supplied by Lingenuity and Oak, is that the Oak interface is faster. However, all SCSI drives are fast compared with an ST506 hard drive, and like greased lightning compared with a floppy disc.

Drive	Capacity	Data transfer rate (Kbytes/sec)		
		Mode 0	Mode 15	Mode 21
Acorn ST506	20Mb	280	271	16
Oak SCSI	20Mb	607	536	55
Oak SCSI	45Mb	659	659	55
Oak SCSI	70Mb	824	820	511
Lin. SCSI	100Mb	689	487	—
Oak SCSI	170Mb	1255	1147	672

Table 1. Comparative transfer rates

PRICES

The interfaces are available from both Lingenuity and Oak separately, or in complete packages with appropriate drives. Some typical prices (all including VAT) are shown in table 2 (all include interface). Note that Lingenuity's A3000 SCSI interface is £50 less than that for the Archimedes, and thus all Lingenuity external hard discs (inc. SCSI interface) should be similarly cheaper for the A3000.

	Lin.	Oak
Archimedes SCSI interface	£228.85	£228.85
A3000 SCSI interface	£171.35	£228.85
Archimedes 20Mb SCSI (Int.)	£431.25	£448.50
A3000 20Mb SCSI (Ext.)	£546.25	£626.75
Archimedes 45Mb (Int.)	£573.85	£586.50
Archimedes 45Mb (Ext.)	£677.35	£764.75
Archimedes 100Mb (Ext.)	£1068.35	—
Archimedes 170Mb (Ext.)	—	£2144.75

Table 2. Typical SCSI prices (inc. VAT)

CONCLUSIONS

There are many factors to consider when selecting a SCSI drive and interface. If you compare prices for similar capacity SCSI drives from different sources, do check the specifications of the drives themselves. At the end of the day you must decide what features are important to you and then make a final decision. For A3000 owners, a SCSI hard disc upgrade may prove cheaper than any other alternative, and should be considered as a serious option. A last point - disc drive specifications are always liable to change as companies like Lingenuity and Oak choose different sources or models, so make sure you have the latest information. RU

Setting Filetypes

A utility by Mike Ironmonger

The concept of *filetype* is very important within the RISC OS environment, and is the means by which, for example, RISC OS knows what to do with a file when you double click on its icon (e.g. run a Basic program, or load a sprite file into Paint, and so on). However, setting filetype is not easy, until now that is.

The utility listed here gives you full control over filetypes from the Desktop. Once installed on the icon bar, dragging any file to the icon bar icon reads that *file's* type and places the corresponding 'type' icon on the icon bar as well. Once a filetype has been installed on the icon bar, dragging any file to that icon will change its filetype accordingly.

Alternatively, if you click with the menu button on the application's icon on the icon bar, you can either *quit* from the application (and it disappears from the icon bar), or you can type in the name or hex code for any filetype of your choosing, and the application will create a corresponding filetype icon on the icon bar. If you specify a filetype by a value which is unknown, the application creates an icon which visually incorporates this value.

If you click with the menu button on any installed filetype icon, you will be shown the corresponding filetype name (if known) or value, and you may also choose to remove that filetype icon from the icon bar. The processes involved take much longer to describe than to perform, and a little practice should quickly make everything quite clear.

SETTING UP THE APPLICATION

You will need to create an application directory called !SetType. The easiest way to do this is to use the *Application shell Generator* published last month (Volume 3 Issue 2) which does most of the work for you. Once created, you can open the application's directory by double clicking on its icon while holding down the Shift key. You will need to type in the program listing given with this article and save it in the application directory as !RunImage.

If you are not using the Application Shell Generator, the !Run file required in the application directory should read as follows:

```
Wimpslot -min 16K -max 16K
Run <Obey$Dir>.!RunImage
```

```
  10 REM             >!RunImage
  20 REM Program     File type setter
  30 REM Version     A 3.10
  40 REM Author      Mike Ironmonger
  50 REM RISC User Jan/Feb 1990
  60 REM Program     Subject to copyright
  70 :
  80 PROCinitialise
  90 ON ERROR PROCerror(ERR,REPORT$)
 100 :
 110 REPEAT
 120 SYS "Wimp_Poll",&81833,block% TO A
%
 130 CASE A% OF
 140 WHEN 6 : PROCcreate_menu(!block%,b
lock%!16)
 150 WHEN 9 : PROCmenu_select(!block%)
 160 WHEN 17,18 : PROCreceive(block%!16
)
 170 ENDCASE
 180 UNTIL quit%
 190 SYS "Wimp_CloseDown"
 200 END
 210 :
 220 DEF PROCmenu_select(S%)
 230 I%=FNwhich_icon(menu_icon%)
 240 CASE I% OF
 250 WHEN 0 :
 260 CASE S% OF
 270 WHEN 0 : SYS "OS_FSControl",31,b_t
ype% TO ,,T%:PROCnew_type(T%)
 280 WHEN 1 : quit%=TRUE
 290 ENDCASE
 300 OTHERWISE : PROCquit(I%)
 310 ENDCASE
 320 ENDPROC
 330 :
 340 DEF PROCreceive(M%)
 350 CASE M% OF
 360 WHEN 0 : quit%=TRUE
```

```
  370 WHEN 3 : PROCdragged_on(FNwhich_ic
on(block%!24))
  380 ENDCASE
  390 ENDPROC
  400 :
  410 DEF PROCquit(I%)
  420 !block%=-1:block%!4=menu_icon%
  430 SYS "Wimp_DeleteIcon",,block%
  440 icon%(I%)=-1
  450 ENDPROC
  460 :
  470 DEF PROCdragged_on(I%)
  480 block%!12=block%!8:block%!16=4
  490 SYS "Wimp_SendMessage",17,block%,b
lock%!4
  500 CASE I% OF
  510 WHEN 0 : PROCnew_type(block%!40)
  520 OTHERWISE SYS "OS_File",&12,block%
+44,type%(I%)
  530 ENDCASE
  540 ENDPROC
  550 :
  560 DEF PROCnew_type(T%)
  570 IF T%>&FFF ERROR 1,"That object ha
s no file type."
  580 I%=FNwhich_icon(-1)
  590 IF icon%(I%)<>-1 ERROR 1,"Can't ha
ndle any more file types."
  600 SYS "OS_ConvertHex4",T%,block%,5
  610 type$=MID$($block%,2,3)
  620 spr$="file_"+type$
  630 SYS "XWimp_SpriteOp",24,,spr$ TO ;
F%
  640 IF (F%AND1)=1 PROCcreate_sprite(sp
r$,type$)
  650 type%(I%)=T%
  660 PROCcreate_icon(I%,spr$)
  670 ENDPROC
  680 :
  690 DEF PROCcreate_sprite(spr$,type$)
  700 SYS "Wimp_BaseOfSprites" TO ,spr%
  710 SYS "OS_Module",13,,spr%,180 TO ,,
newspr%
  720 !newspr%+=180
  730 SYS "OS_Module",18,"WindowManager"
 TO ,,,,wspace%
  740 wspace%!540=newspr%
  750 SYS "OS_SpriteOp",&10F,newspr%,spr
$,0,34,17,0
  760 SYS "OS_SpriteOp",&13C,newspr%,spr
$ TO R0,R1,R2,R3
  770 GCOL7:RECTANGLE 0,0,64,64
  780 RECTANGLE 2,0,64,64
  790 VDU5:MOVE 10,44:PRINTtype$
  800 SYS "OS_SpriteOp",R0,R1,R2,R3
  810 ENDPROC
  820 :
  830 DEF FNwhich_icon(F%)
  840 I%=0
  850 WHILE icon%(I%)<>F% AND I%<max_typ
es%
  860 I%+=1
  870 ENDWHILE
  880 =I%
  890 :
  900 DEF PROCerror(!block%,$(block%+4))
  910 SYS "Wimp_ReportError",block%,1,"S
etType"
  920 ENDPROC
  930 :
  940 DEF PROCinitialise
  950 DIM block% 99,menu% 99,b_type% 19,
i_name% 8,i_type% 3
  960 max_types%=5
  970 DIM icon%(max_types%),type%(max_ty
pes%):icon%()=-1
  980 quit%=FALSE
  990 SYS "Wimp_Initialise",200,&4B53415
4,"SetType"
 1000 PROCcreate_icon(0,"!SetType")
 1010 ENDPROC
 1020 :
 1030 DEF PROCcreate_icon(I%,spr$)
 1040 !block%=-1
 1050 block%!4=0:block%!12=68
 1060 block%!8=0:block%!16=68
 1070 block%!20=2:$(block%+24)=spr$
 1080 SYS "Wimp_CreateIcon",,block% TO i
con%(I%)
 1090 ENDPROC
 1100 :
 1110 DEF PROCcreate_menu(X%,I%)
 1120 menu_icon%=I%:M%=menu%
 1130 icon%=FNwhich_icon(I%)
 1140 IF icon%=0 THEN
 1150 $M%="SetType"
 1160 M%!12=&70207:M%!16=192:M%!20=40
 1170 M%!24=0:M%!28=4:M%!32=0
 1180 M%!36=&7000121:M%!40=b_type%
 1190 $b_type%="":M%!44=-1:M%!48=20
 1200 M%!52=&80:M%!56=0:M%!60=&7000021
 1210 $(M%+64)="Quit"
 1220 SYS "Wimp_CreateMenu",,M%,X%-64,17
6
 1230 ELSE
 1240 SYS "OS_FSControl",18,,type%(icon%
) TO ,,A%,B%
 1250 M%!0=A%:M%!4=B%:M%?8=13
 1260 M%!12=&70207:M%!16=192:M%!20=40
 1270 M%!24=0:M%!28=&80:M%!32=-1
 1280 M%!36=&7000021:$(M%+40)="Remove Ic
on"
 1290 SYS "Wimp_CreateMenu",,M%,X%-64,13
6
 1300 ENDIF
 1310 ENDPROC
```

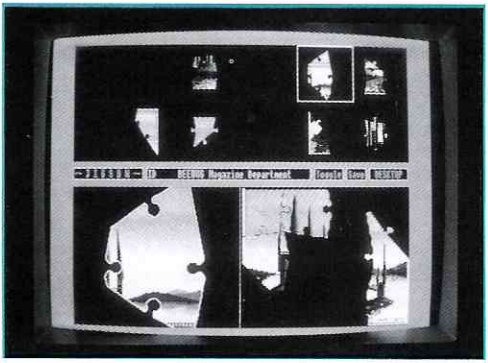
RU

Jigsaw - A Real Puzzle

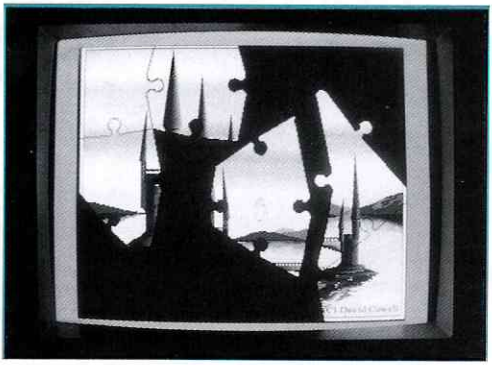
Reviewed by Mike Williams

Occasionally, a piece of software appears which is beautifully simple in concept and has immediate appeal. *Jigsaw* by 4mation is just such a program, one which is sure to keep young children enthralled for hours yet, challenging enough for all ages.

The idea is so simple. Take any suitable screen picture, cut it up into jigsaw pieces and jumble these up on the screen. Then use the mouse to select and position pieces to complete the puzzle. The pieces are displayed in the top half of the screen at reduced scale, with the currently selected piece at full size, and a replica, again at a reduced size, of the partially completed jigsaw. Pressing the menu button reveals the jigsaw at full size, and the selected piece can be moved into position (and repositioned again later if at first you get it wrong).



The main jigsaw display showing pieces



Inserting a piece in a partly completed puzzle

Any of 24 possible levels of difficulty may be selected, cutting a picture into anything from 12 to 120 pieces. You can choose whether pieces are presented the right way up or not, and whether the complete picture should be available for reference while completing the puzzle.

What is more, any screen image saved as a sprite may be used as subject matter for a jigsaw, so you can create your own puzzles, using Paint for example. And while *Jigsaw* stores pictures in a highly compressed format, these can be exported as sprites, and sprites loaded and resaved as compressed pictures.

Some 15 superb pictures are supplied as part of the two disc pack, together with eighteen pages of documentation.

This is an unusual piece of software, maybe limited in its application, but a delight to use. And if you think it all sounds too easy, then trying to solve a puzzle at the higher levels of difficulty will tie even the most enthusiastic puzzler into knots - recommended, though somewhat pricey.

Product	*Jigsaw*
Supplier	*4mation* *Linden Lea, Rock Park,* *Barnstaple, Devon EX32 9AQ.* *Tel. (0271) 45566*
Price	*£33.35 inc. VAT.*

RU

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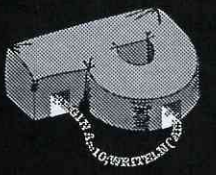

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Cambridge Pascal is a comprehensive version of the Pascal language and includes many extra enhancing features over the standard specification including full dynamic string handling, local error handling, random access files, direct access to 'star' commands and RISC OS SWI calls. It is 100% Desktop compatible but can also be run from the command line. All programs compile into fast, efficient machine code.

Cambridge Pascal requires any Archimedes running RISC OS with at least 1Mb of RAM. Hard discs and extra memory are useful, but the system is perfectly workable with this minimum configuration.

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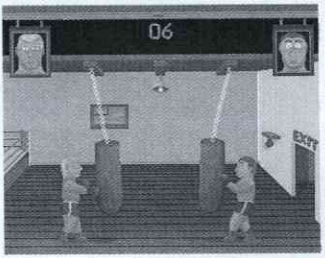
ARCHIMEDES



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Outline Fonts

A Survey by Lee Calcraft

Acorn have recently released their new Outline Font Manager which provides for high quality anti-aliased fonts on the Archimedes (for further details see *Of Printers Drivers and Fonts* in the last issue). These fonts may be used in Draw, and in DTP packages such as Acorn DTP, Impression and the forthcoming Beebug DTP, as well as in users' own programs.

Trinity Medium
Trinity Medium Italic
Trinity Bold
Trinity Bold Italic
Homerton Medium
Homerton Medium Italic
Homerton Bold
Homerton Bold Italic
Corpus Medium
Corpus Medium Italic
Corpus Bold
Corpus Bold Italic

Acorn's Font Starter Pack consists of 3 basic fonts in 4 standard styles

Because of this there is considerable interest in the subject, and a number of companies are marketing (or preparing to market) new outline fonts for the Archimedes. We present here a summary of those fonts which are currently available, and those in the pipeline.

ACORN

As part of their DTP package, Acorn supply the outline font manager with the following 3 fonts in the four styles medium, medium italic, bold and bold italic:

Corpus	(Courier)
Trinity	(Times)
Homerton	(Helvetica)

Additionally, current versions of their DTP have a limited number of symbol characters, supplied as Selwyn (equivalent to about one quarter of Zapf Dingbats), plus Newhall bold. This latter is a single-style version of New Century Schoolbook.

Acorn are now marketing a number of font packs separately, as follows, each costing £51.75 inc. VAT:

Font Starter Pack

This contains Corpus, Trinity and Homerton in the four standard styles (medium, medium italic etc.), plus the outline font manager. Available early January 1990.

Newhall Font Pack

Newhall (New Century Schoolbook) in the four standard styles. Available early February 1990.

Acorn Symbols Font Pack

Selwyn - a complete symbols set, equivalent to Zapf Dingbats. This may additionally include some mathematical symbols. Available Spring 1990.

All of these fonts are designed for Acorn by Oxford-based Digital Type Systems.

COMPUTER CONCEPTS

Computer Concepts supply the sets of fonts from Acorn's Font Starter Pack (Trinity, Homerton and Corpus in 4 styles), together with the outline font manager as part of the Impression package. Additionally, Impression 1.0 (the release version) will contain the font Greek3, consisting of the Greek alphabet in upper and lower case.

Computer Concepts are also working on a Palatino equivalent - projected name *Pembroke* (matching Acorn's Cambridge colleges with an Oxford counterpart). When it becomes available in the new year, this will probably be marketed as a separate disc-based product costing around £20. It may also be included with future versions of Impression.

Greek3
ABXΔΕΦΓΗΙϑΚΛΜΝΟΠΘΡΣΤΥςΩΞΨΖ
αβχδεφγηιφκλμνοπθρστυϖωξψζ

Pembroke
ABCDEFGHIJKLMNOPQRSTUVWXYZ
1234567890 abcdefghijklmnopqrstuvwxyz

Computer Concepts' Greek3 and Pembroke fonts

Avant Garde
ABCDEFGHIJKLMNOPQRSTUVWXYZ
1234567890 abcdefghijklmnopqrstuvwxyz

Palatino
ABCDEFGHIJKLMNOPQRSTUVWXYZ
1234567890 abcdefghijklmnopqrstuvwxyz

Bookman
ABCDEFGHIJKLMNOPQRSTUVWXYZ
1234567890 abcdefghijklmnopqrstuvwxyz

Garamond
ABCDEFGHIJKLMNOPQRSTUVWXYZ
1234567890 abcdefghijklmnopqrstuvwxyz

Zapf Chancery
ABCDEFGHIJKLMNOPQRSTUVWXYZ
1234567890 abcdefghijklmnopqrstuvwxyz

Schoolbook
ABCDEFGHIJKLMNOPQRSTUVWXYZ
1234567890 abcdefghijklmnopqrstuvwxyz

Optima
ABCDEFGHIJKLMNOPQRSTUVWXYZ
1234567890 abcdefghijklmnopqrstuvwxyz

Zapf Dingbats

Apple LaserWriter versions of other fonts under development

CLARES MICRO SUPPLIES

When Clares release their DTP, it will be supplied with a number of Acorn fonts together with the outline font manager, but precisely which fonts, has not yet been decided.

BEEBUG

Beebug DTP will contain at least three fonts in the four standard styles, plus the outline font manager. Additionally, Beebug will be marketing a number of font packs on disc in the new year, each containing four different fonts. These are expected to cost around £30-£40 per pack, as follows:

Pack One
*Helvetica equivalent
*Avant Garde equivalent
*Palatino equivalent
Symbols - A greek character set with some additional mathematical symbols

Pack two
*Courier equivalent
*Bookman equivalent
*Garamond equivalent
Zapf Chancery equivalent

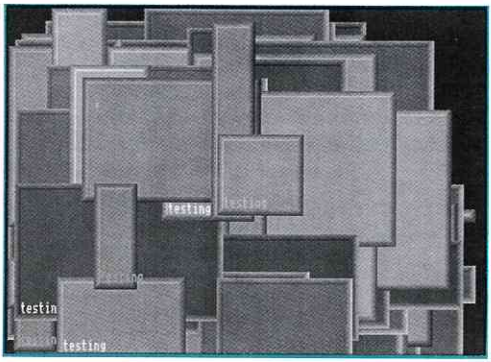
Pack three
*Times equivalent
*New Century Schoolbook equivalent
*Optima equivalent
Zapf Dingbats equivalent

The starred items will be available in the four standard styles (medium, medium italic, bold and bold italic). RU

Coloured Text Panels

This program by Barry Christie assembles a module for the speedy display of coloured text panels in mode 15.

The program listed here assembles a module (called SlabModule) which makes the creation of three dimensional coloured panels (referred to as slabs) for text displays extremely easy, and of course fast. The program also contains definitions for five procedures, designed to make the use of the module from your own programs as simple as possible, and the listing also contains a demonstration of the module in action. Note that the module and its use is restricted to mode 15, a 256 colour mode.



Slab module demonstration screen

The source code for the module is in the form of a procedure (starting at line 420), which is called once to assemble and save the module. The procedures which use the assembled module are listed from lines 120 to 400, and these procedures should be included in your own programs where you want to use the slab drawing module. Finally, in the listing, the demonstration procedure is at the end, and is called once after the module has first been assembled.

The module has to be initialised before use by calling PROCinitslab, which tells the module where the resident integer variables are stored. This is because the module uses these variables when passing parameters back and forth between the program and the module. For convenience, the descriptions below use more meaningful letters to represent parameters.

The other procedures are as follows:

PROCslab(x,y,w,h,t)
This is used to draw a slab on the screen, and the parameters are:

x = x co-ordinate (0-79)
y = y co-ordinate (0-63)
w = width (0-80), h = height (0-64)
t = type (0=raised/1=sunken)

PROCslabcolr(c)
This is used to decide the slab colour. Its parameter is:

c = colour (0=grey, 1=blue, 2=magenta, 3=green, 4=gold, 5=cyan)

PROCtext(x,y,t$)
This is used to place text on the screen. The parameters are:

x = x co-ordinate (0-79)
y = y co-ordinate (0-63)
t = text

PROCtextcolr(t)
This is used to determine the colour of the text, with parameter:

t=colour
(0=background, 1=foreground, 2=white)

PROCinitslab
This is used to initialise the slab module (see above). The screen base address is returned in A%.

If you are going to use the module from within your own programs you will first

need to load the module, by double clicking on its icon from the Desktop, or by using the *RMLOAD command in your program, e.g.:

```
*RMLOAD SlabModule
```

Note: No range checking is used, so if a slab goes off the screen an error will be given.

The module implements three star commands called by the procedures described above. These are:

InitCode <address>
This initialises slab drawing to use the resident integer variables.

SlabColr
This determines the slab colour specified in A%.

ShowSlab
This command draws a slab on the screen using the integer variables A% to E% to supply all information as for PROCslab above.

```
 10 REM            >SlabDraw
 20 REM Program    Arc Slab Draw Module
 30 REM Version    A 1.3
 40 REM Author     Barry Christie
 50 REM RISC User  Jan/Feb 1989
 60 REM Program    Subject to copyright
 70 :
 80 MODE 0:PROCslabmodule(2)
 90 MODE 13:PROCslabmoduledemo
100 END
110 :
120 DEF PROCslab(A%,B%,C%,D%,E%)
130 OSCLI("ShowSlab")
140 ENDPROC
150 :
160 DEF PROCslabcolr(A%)
170 OSCLI"SlabColr":backC=A%:foreC=B%
180 ENDPROC
190 :
200 DEF PROCtext(A%,B%,A$)
210 VDU5:PLOT4,A%*16,B%*16+28
220 PRINT A$:VDU4
230 ENDPROC
240 :
250 DEF PROCtextcolr(backfore)
260 CASE backfore OF
270 WHEN 0 : GCOL 0,backC TINT 192
280 WHEN 1 : GCOL 0,foreC TINT 192
290 WHEN 2 : GCOL 0,   63 TINT 192
300 ENDCASE
310 ENDPROC
320 :
330 DEF PROCinitslab
340 DIM workarea 16
350 workarea!&00=&E5990000
360 workarea!&04=&E58F0000
370 workarea!&08=&E1A0F00E
380 CALL workarea,A%
390 OSCLI("InitCode "+STR$(workarea!&0
C))
400 ENDPROC
410 :
420 DEF PROCslabmodule(opt)
430 DIM codearea &1000:REM 4k
440 zero$=STRING$(12,CHR$0)
450 modulestitle$="SlabDrawing"+CHR$0
460 moduleshelps$="SlabDrawing"+CHR$9+
"1.30 ("+LEFT$(TIME$,15)+")"+CHR$0
470 :
480 FOR pass=4 TO 4+opt STEP opt
490 O%=codearea:P%=&0000
500 [OPT pass
510 .moduleheader
520 EQUD &00000000:EQUD &00000000
530 EQUD &00000000:EQUD &00000000
540 EQUD moduletitle
550 EQUD modulehelps
560 EQUD modulecmnds
570 .moduletitle
580 EQUS modulestitle$:ALIGN
590 .modulehelps
600 EQUS moduleshelps$:ALIGN
610 .modulecmnds
620 EQUS "InitCode":EQUB 0:ALIGN
630 EQUD initcode
640 EQUD &00010001
650 EQUD &00000000
660 EQUD &00000000
670 EQUS "ShowSlab":EQUB 0:ALIGN
680 EQUD showslabcode:EQUS zero$
690 EQUS "SlabColr":EQUB 0:ALIGN
```

```
 700 EQUD slabcolrcode:EQUS zero$
 710 EQUD &00000000
 720 .sysinput EQUD &94:EQUD &FFFFFFFF
 730 .scrnaddr EQUD &00000000
 740 .basvalue EQUD &00000000
 750 .modtmpry ; temporary storage area
 760 .modtmp00 EQUD &00000000
 770 .modtmp01 EQUD &00000000
 780 .modtmp02 EQUD &00000000
 790 .modtmp03 EQUD &00000000
 800 .modtmp04 EQUD &00000000
 810 .modtmp05 EQUD &00000000
 820 .modvalue ; parameter area
 830 .modval00 EQUD &00000000
 840 .modval01 EQUD &00000000
 850 .modval02 EQUD &00000000
 860 .modval03 EQUD &00000000
 870 .modval04 EQUD &00000000
 880 .initcode
 890 STMFD R13!,{R0-R12,R14}
 900 MOV  R2,#&80000000 ; maximum value
 910 MOV  R1,R0 ; address of string
 920 MOV  R0,#&0A ; base to use (ie.10)
 930 SWI  "XOS_ReadUnsigned"
 940 BVS  initeror
 950 STR  R2,basvalue
 960 BL   scrnbasecode
 970 LDMFD R13!,{R0-R12,R15}
 980 .initeror
 990 LDMFD R13!,{R0-R12,R14}
1000 ADR  R0,erortext
1010 ORR R14,R14,#&10000000
1020 MOVS PC,R14
1030 .erortext EQUD &BAD0BEEB
1040 EQUS "Cannot Initialise"
1050 EQUB &00:ALIGN
1060 .loadbasval
1070 LDR  R10,basvalue
1080 ADR  R11,modvalue
1090 LDMIA R10,{R0-R4}
1100 STMIA R11,{R0-R4}
1110 MOV  R15,R14
1120 .savebasval
1130 LDR  R10,basvalue
1140 ADR  R11,modvalue
1150 LDMIA R11,{R0-R4}
1160 STMIA R10,{R0-R4}
1170 MOV  R15,R14
1180 .scrnbasecode
1190 STMFD R13!,{R0-R12,R14}
1200 ADR  R0,sysinput
1210 ADR  R1,scrnaddr
1220 SWI  "XOS_ReadVduVariables"
1230 LDMVSFD R13!,{R0-R12,R15}
1240 LDR  R0,scrnaddr
1250 STR  R0,modval00
1260 BL   savebasval
1270 LDMFD R13!,{R0-R12,R15}
1280 .calcscrnxy16
1290 STMFD R13!,{R14}
1300 RSB  R1,R1,#&40
1310 LDR  R14,scrnaddr
1320 ADD  R0,R14,R0,ASL#&03; SB+X*8
1330 MOV  R14,#&A00
1340 MLA  R0,R1,R14,R0
1350 LDMFD R13!,{R15}
1360 .showslabcode
1370 STMFD R13!,{R0-R12,R14}
1380 BL   loadbasval ; get parameters
1390 ADD  R1,R1,R3
1400 BL   calcscrnxy16
1410 STR  R0,modtmp00
1420 SUB  R2,R2,#&02 ; x border bit
1430 STR  R2,modtmp01 ; slab x width
1440 SUB  R3,R3,#&02 ; y border bit
1450 STR  R3,modtmp02 ; slab y width
1460 ADR  R0,slabdata ; base addr of
1470 CMP  R4,#&01 ; slab information
1480 ADDEQ R0,R0,#&120
1490 STR  R0,modtmp03
1500 ADD  R0,R0,#&60
1510 STR  R0,modtmp04
1520 ADD  R0,R0,#&60
1530 STR  R0,modtmp05
1540 LDR  R10,modtmp03
1550 LDR  R11,modtmp01
1560 MOV  R12,#&01
1570 BL   drawslabline
1580 LDR  R10,modtmp04
1590 LDR  R11,modtmp01
1600 LDR  R12,modtmp02
1610 BL   drawslabline
1620 LDR  R10,modtmp05
1630 LDR  R11,modtmp01
1640 MOV  R12,#&01
1650 BL   drawslabline
1660 LDMFD R13!,{R0-R12,R15}
1670 .drawslabline
```

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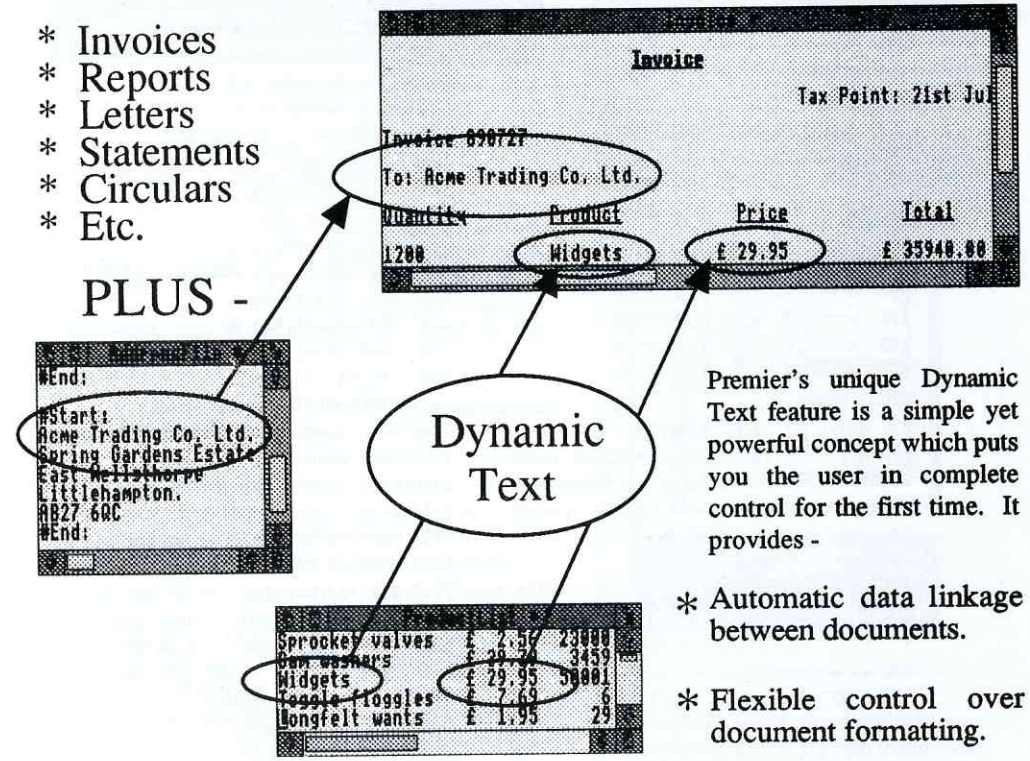

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Premier 3 may be purchased directly by phone, quoting your MasterCard (Access) or Visa card number, or from your nearest Acorn dealer. Educational discounts and multi-machine licences are available.

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```
1680 SUBS R12,R12,#&01
1690 MOVMI R15,R14
1700 MOV  R1,#&04
1710 MOV  R2,R10
1720 .nowdrawline1
1730 LDR R0,modtmp00
1740 ADD  R4,R0,#&280
1750 STR  R4,modtmp00
1760 MOV  R3,R11
1770 LDMIA R2!,{R4-R9}
1780 STMIA R0!,{R4-R5}
1790 .nowdrawline2
1800 SUBS R3,R3,#&01
1810 STMPLIA R0!,{R6-R7}
1820 BPL  nowdrawline2
1830 STMIA R0!,{R8-R9}
1840 SUBS R1,R1,#&01
1850 BNE  nowdrawline1
1860 B    drawslabline
1870 .slabcolrcode
1880 STMFD R13!,{R0-R12,R14}
1890 BL   loadbasval ; get parameters
1900 MOV  R1,#&08
1910 ADR  R2,slabcolr
1920 MLA  R1,R0,R1,R2
1930 ADR  R0,slabdata
1940 ADR  R2,slabmaps
1950 MOV  R3,#&90
1960 .slabcolrloop
1970 LDRB R4,[R2],#&01
1980 MOV  R5,R4,LSR#&04
1990 AND  R4,R4,#&0F
2000 LDRB R6,[R1,R4]
2010 STRB R6,[R0],#&01
2020 STRB R6,[R0],#&01
2030 LDRB R6,[R1,R5]
2040 STRB R6,[R0],#&01
2050 STRB R6,[R0],#&01
2060 SUBS R3,R3,#&01
2070 BNE  slabcolrloop
2080 LDR  R0,basvalue
2090 LDRB R2,[R1,#&06]
2100 STR  R2,[R0,#&00]
2110 LDRB R2,[R1,#&07]
2120 STR  R2,[R0,#&04]
2130 LDMFD R13!,{R0-R12,R15}
2140 .slabcolr
2150 EQUD &2FD32DD1:EQUD &3F15FFFD
2160 EQUD &0BA709A5:EQUD &3A10DBD9
2170 EQUD &0FB30DB1:EQUD &3B11DFDD
2180 EQUD &234F214D:EQUD &2E04F3F1
2190 EQUD &2BC729C4:EQUD &3E14FBF9
2200 EQUD &073B0539:EQUD &2B01D7D5
2210 EQUD &275B2559:EQUD &2F05F7F5
2220 .slabmaps
2230 EQUD &00000000:EQUD &22201000
2240 EQUD &13222222:EQUD &44444420
2250 EQUD &54201304:EQUD &13025555
2260 EQUD &44445420:EQUD &54201302
2270 EQUD &13024444:EQUD &44445420
2280 EQUD &54201302:EQUD &13024444
2290 EQUD &22222420:EQUD &00201302
2300 EQUD &13000000:EQUD &33333330
2310 EQUD &11111333:EQUD &11111111
2320 EQUD &22222222:EQUD &00025222
2330 EQUD &54000000:EQUD &33333302
2340 EQUD &13025423:EQUD &54201111
2350 EQUD &33331302:EQUD &13025420
2360 EQUD &54203333:EQUD &33331302
2370 EQUD &13025420:EQUD &54203333
2380 EQUD &00000302:EQUD &22025420
2390 EQUD &54222222:EQUD &44444442
2400 EQUD &55555444:EQUD &55555555
2410 .slabdata
2420 EQUS STRING$(144,CHR$0)
2430 EQUS STRING$(144,CHR$0)
2440 EQUS STRING$(144,CHR$0)
2450 EQUS STRING$(144,CHR$0)
2460 ]
2470 NEXT pass
2480 SYS "OS_File",&0A,"SlabModule",&FF
A,,codearea,0%
2490 ENDPROC
2500 :
2510 DEF PROCslabmoduledemo
2520 *RMLoad SlabModule
2530 PROCinitslab
2540 REPEAT
2550 scol=RND(6):tcol=RND(2):xco=RND(40
):yco=RND(32)
2560 PROCslabcolr(scol):PROCslab(xco,yc
o,RND(40),RND(32),RND(100) MOD 2)
2570 PROCtextcolr(tcol):PROCtext(xco+1,
yco+1,"testing")
2580 UNTIL FALSE
2590 ENDPROC
```

RU

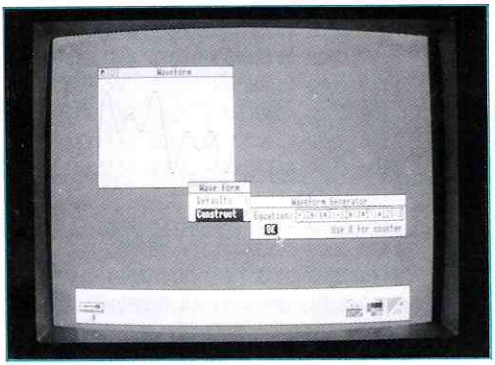
A Voice Module Generator

Felix Andrew describes an innovative program which will create a voice module from a user-generated waveform.

The program is supplied only on this month's magazine disc.

The sound system of the Archimedes comes equipped with nine so-called voices (see Into the Arc, RISC User Volume 3 Issue 1). However, the possibilities of these can soon become exhausted.

This application allows you to generate additional voices easily and simply from a waveform. There are two ways to generate the shape of this. Firstly, you can draw the shape of the waveform in a window using the mouse. Secondly, you can use a mathematical formula to generate the waveform.



Waveform window showing default calculated shape

The waveform, once created, can be saved in two different ways. It can be saved in its simple form as a small 256 byte data file. These data files can be further edited as required. The waveform can also be saved in the form of a relocatable voice module. Once it has been saved like this, the voice can be used in Maestro (on Applications Disc 2) or like any other voice (see again the article in RISC User Volume 3 Issue 1).

INSTALLING AND USING THE APPLICATION

The program is supplied on disc as an application called !VoiceGen. Double clicking its icon in the directory viewer will install the application on the icon bar. Clicking on this with the Menu button will reveal four options, of which Info and Quit should be self-explanatory.

There are two save entries - Create Module and Save Waveform. The Save Waveform entry saves a data file of 256 bytes which represents just the shape of the waveform. Once you have saved the waveform, it can be modified at a later date by dragging the data file to the application icon on the icon bar.

The Create module will create and save a relocatable voice module. Voice modules can be installed easily by double clicking on their icons from the Desktop or by using *RMLOAD <module name>. However, these relocatable modules cannot be loaded back into the application to allow any further modification of the waveform.

If you save a waveform as data (by dragging the 'data' icon from the Save as: window to a directory viewer), the program will add an 'm' to the end of the same file name if you then choose to save the same waveform as a voice module. This makes it simple to save a waveform as both data and module.

If you click with the select button on the application icon the Waveform window itself will be displayed. This shows the current voice waveform and allows real-time editing.

THE WAVEFORM WINDOW

When you click in this window with the select button you can directly create or alter the shape of the waveform. If you move the mouse too quickly while drawing, you may find that 'spikes' appear. This is because the application is not notified quickly enough by the Wimp to deal with intermediate mouse positions. If the mouse is moved smoothly and slowly this problem can be avoided.

The menu button will cause the Wave form menu to be opened. There are two entries - Defaults and Construct. Defaults gives you the option of setting the waveform to one of three standard shapes: Sine Wave, Square Wave and Sawtooth. The Construct entry allows you to define the shape of the waveform using simple expressions. This may be a little mathematical for some, but it doesn't hurt to play around with it for a while, as we shall see.

CONSTRUCTING EXPRESSIONS

The expression that you type in is taken as the function of the time variable 'X'. X is measured in radians to make things easier later on. It takes values from 0 to 2PI. To make it a bit easier to understand, just type in the number 128. You will see that you get a horizontal line in the middle of the waveform. The bottom value of the waveform is zero, and the top value is 255, so the middle value is 128.

A simple sine wave can be created by typing in: (SIN(X)*128)+128. The reason why the sine is multiplied by 128 is that a sine normally gives values in the range -1 to +1. We need to magnify this amplitude by 128 to give a range of -128 to +128 to fill the window. However, the window accommodates values in the range 0 to 256, so a further 128 is added on to the expression to compensate for this.

If you want a sine wave of twice the frequency, two peaks instead of one, then you would type in: (SIN(2*X)*128)+128. We use 2*X which doubles the step size, so you get twice as many peaks in the waveform. If you had typed 3*X, then you would get 3 peaks and so on.

The more peaks, the higher the frequency. The number you use to multiply by is called the harmonic. To use two harmonics you might try:

```
128+(SIN(3*X)+SIN(5*X))/2*128
```

which will result in a waveform which might look a little odd but it sounds subtly different to a normal sine wave. Note the division by 2 now that two sine waves are added together.

You may also decide to alter the amplitude of the harmonics. In this case you will have to take care in deciding by how much to multiply each individual harmonic (sine). If you wanted a dominant harmonic with twice the amplitude of the other then you could try:

```
128+(2*(SIN(3*X))+(SIN(5*X))*128/3
```

This method of designing waveforms is quite complex; the best approach, as always, is to experiment.

LISTENING TO A WAVEFORM

To hear how any waveform sounds, proceed as follows. First save the data and create a module. Once the module has been saved, double click on it from the Desktop. It has now been loaded into memory. If you type *VOICES you will see that a new voice has been created (the voice name is the same as that for the module). You can now attach a channel to the voice by typing:

```
*Channelvoice 1 <voicename>
```

If you now press the Copy key or Ctrl-G, you will be able to hear the new voice. Alternatively, use:.

```
SOUND 1, -15,<note>,<duration>
```

where note is in the range 1-255 and duration is in the range 0-254.

To summarise, the steps involved in creating and playing a new sound are:

1. Draw or construct a waveform.
2. Use Save Waveform and save it as a data file (say, NewBell).
3. Use Create Module to create and save the relocatable module. Simply open the save window and click on OK.
4. Double click on the RM NewBellm.
5. Press F12.
6. Type *VOICES
7. Type *CHANNELVOICE 1 NewBellm
8. Press the copy key or Ctrl-G.

Remember to press Return to get back to the Desktop. You can also speed things up when experimenting, by saving waveforms to a RAM disc.

INSTALLING VOICES

After re-editing a waveform for a voice already in use, you will need to both reload the voice module and re-assign the voice to a channel using *ChannelVoice, otherwise no sound is likely to be heard.

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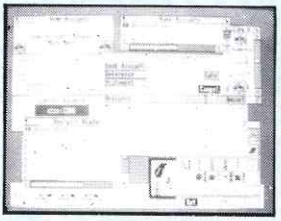

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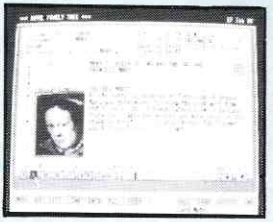

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System Fonts

We provide 10 new system fonts on the magazine disc. Alan Wrigley explains what they are, and how to manipulate the resident font.

With all the attention currently being lavished on Acorn's new Outline Fonts, the poor old standard System Font has been rather neglected. This short article sets out to rectify that situation.

The System Font is the one you normally see when the machine is first switched on. The characters are formed on an 8x8 pixel grid, exactly as was done on the BBC Micro. In addition to the standard ASCII characters (codes 32-126), the Archimedes has an extended character set from 128-255, any and all of which can be accessed from the keyboard by holding down the Alt key, entering the character code on the numeric keyboard, and then releasing the Alt key again. For example, hold down Alt, type in 169 on the numeric keypad and release Alt - you will get a copyright sign on the screen. This set includes accented characters, some Greek letters, and a number of symbols. To display the whole of the extended character set, use:

```
FOR A=128 TO 255:P.;A" "CHR$A,;:NEXT
```

Just as on the BBC Micro, the characters can be redefined by using VDU23,<character code>,x1,x2,x3,x4,x5, x6, x7,x8 where x1 to x8 contain the pixel information for each of 8 rows from top to bottom , with the most significant bit of each byte representing the pixel to the left. Each bit which is set denotes a pixel which is to appear in the character. For example:

```
VDU23,165,102,60,24,24,126,24,24,0
```

defines character 165 as a yen sign (see Figure 1).

However, the Archimedes also provides the facility to store system fonts on disc and then load them back into the machine later. A system font file is given a filetype of FF7 (BBC Font), and consists simply of a string of bytes, 10 per character, which represent all the VDU codes, starting from the initial '23', required to redefine whichever characters you wish to alter in the range 32-255. Double-clicking on a file with this filetype causes a *PRINT operation to be performed on the file, which effectively defines the new font immediately.

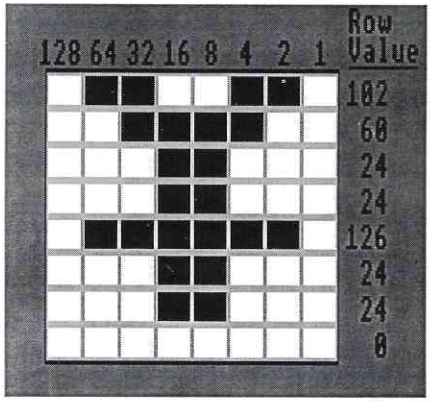

Figure 1

Creating system font files is very simple. The easiest way is to use a short Basic program similar to the one given below.

```
  10 REM TO REDEFINE n CHARACTERS
  20 F=OPENOUT"MySysFont"
  30 FOR I=1 TO n*10
  40 READ X:BPUT# F,X
  50 NEXT
  60 CLOSE# F
  70 *SetType MySysFont FF7
  80 END
 100 DATA 23,32,0,0,0,0,0,0,0,0
 110 DATA 23,33,.............
 120 DATA ..................
```

Note that n should be set to the number of characters to be redefined. The example assumes we are redefining characters from code 32 upwards (the start of the printable characters).

Instead of line 70 you may also set the filetype after the font file has been created by using the Set Filetype application described elsewhere in this issue.

Figure 2

Since the file contains nothing but VDU codes, there is nothing to stop you including other VDU sequences in the file if you wish, for example palette information using VDU19. In fact, it is perfectly possible to append a palette file onto the end of a font file, although not the other way around as the run action for a palette file is different.

The hardest part, of course, is redefining the characters in the first place. This is made a lot easier by the use of a character designer, such as !CharDes which appeared on the RISC User disc for Volume 3 Issue 2, which will generate complete font files from designs entered via the mouse.

This month's magazine disc contains 10 complete font files, which are shown in Figure 2. Any of these can be installed by double clicking on the font's icon from the Desktop. This font then becomes immediately active.

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Into the Arc - Desktop Publishing with Draw

Richard Mawhood explains how to use the Draw application for simple desktop publishing

I suspect that many readers are put off desktop publishing by the cost and apparent complexity of the available dedicated software, particularly if they are not really sure if this is the best way to go about it. Plenty of people have pointed out that you can do quite a good job with scissors, glue and a simple word processing system. However, RISC OS users have better opportunities to experiment without going in for all the sophistication, and at no cost at all!

I teach in a secondary school, and I wanted to produce some articles in a magazine format for my sixth-form class; to cap it all, in a foreign language (French)! 1st Word Plus copes superbly with almost all my word processing needs; foreign text is no problem - it has the easiest method I've yet seen for obtaining accented characters. But it can't produce text in columns, which was what I was after.

This is where the Draw application (supplied on Applications Disc 2) comes in - on page 117 of the User Guide I read that Draw can format text into columns. Great! I started work right away, and ... nearly gave up a few times ..., but a week later, I had the final product - and a much better understanding of the manual, the various applications used, and some of the limitations that exist. I hope that sharing my experiences will save you time and frustration if you try this for yourself.

It's probably easiest to prepare your text with a word processor or you can use Edit; headlines are best done like this too, but separately from the main text, as this gives you most control over their final appearance. All of this must be saved without the embedded style and format control codes, i.e. not in word processing mode. Control over the way the text appears in Draw is obtained by inserting a text "header", which allows any of the following to be specified:

justification
font and font size
number of columns
line spacing
margins
text colours
various miscellaneous features

Each specification in the header consists of an abbreviated form of command always commencing with the 'back-slash' character '\'. These are defined in the (new) User Guide on pages 118 to 125. For example, I used this header for the main body of the article:

```
\!1          - tells Draw that this is text
\AD          - justified both left and right
\D2          - in two columns
\F0 Trinity.Medium 10 - font number 0 is 10-point Trinity
\L10         - 10-point line spacing
\M0 0        - no margins, right or left.
```

These are the margins for each column, not the page

```
\P10         - extra paragraph spacing of
```

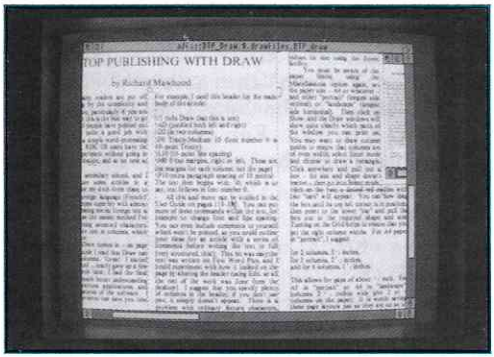
10 points. The text then begins with: \0, meaning that text follows immediately in font number 0.

The header effectively defines the so-called *text area* in Draw. You can also put more of these commands within the text, for example to change font and line spacing. You can even include comments to yourself which won't be printed, so you could outline your ideas for an article with a series of comments before writing the text in full (very structured).

This bit was easy; the text was written in 1st Word Plus including the header commands, and I could experiment with

how it looked on the page by altering the header (using Edit, so that all the rest of the work was done from the Desktop). I suggest that you specify plenty of columns in the header; if you don't use one, it simply doesn't appear.

There is a problem with ordinary Return characters - e.g. at the end of a paragraph - as they simply get ignored. To force a line break, you have to enter '\' before pressing Return itself. Alternatively, at the end of a paragraph, if you leave an empty line, Draw will insert between the paragraphs whatever space you specify in the header.



Part of this article in a Draw text area

An initial reading of the User Guide on this subject may appear quite daunting, but persevere, and above all be prepared to experiment until you begin to get a feel for what is going on.

Before starting Draw, it's best to enlarge the font cache using the task display window. I used at least 80K, which speeds up redrawing the screen considerably. Text in Draw can only use outline fonts, not system fonts. You may also need to load first the fonts supplied on Applications Disc 1 (by double clicking on the Fonts folder in the directory viewer for this disc) before proceeding.

So having created your text file, with appropriate header, the next step is to install Draw (if not already present). Then when you have opened a Draw window, it is quite helpful to have a second view reduced to a quarter size (a sort of mini-page) to show the overall appearance. You can get a "new view" through the *Miscellaneous* option in the Draw menu; when it appears, reduce its size using the *Zoom* facility (e.g. use 1:4).

You must also be aware of the paper limits; using the *Miscellaneous* option again, set the paper size - A4 or whatever - and either "portrait" (longest side vertical) or "landscape" (longest side horizontal). Then click on *Show*, and the Draw windows will show quite clearly which parts of the window you can use.

You may want to draw column guides to ensure that columns of text are of even width; select the rectangle drawing tool from the Toolbox frame (or use Menu and select the *Enter* option followed by *Rectangle)*. Click anywhere in the Draw window and drag out a box - the size and shape doesn't matter initially.

Then go into *Select* mode (the bottom-most tool, or by using the Menu button again), and click anywhere on the box outline; a dotted red outline with two "ears" will appear. You can now drag the box until its top left corner is in the required position; then point to the lower "ear" and pull the box out to the required shape and size. Turning on the *Grid* helps to ensure that you get the right column widths. For A4 paper in "portrait", I suggest the following widths: for 2 columns, 3 3/4 inches, for 3 columns, 2 5/12 inches, and for 4 columns, 1 3/4 inches. This allows for gaps of about 1/4 inch. For A5 in "portrait" or A4 in "landscape", columns 2 1/4 inches wide give 2 or 4 columns on the paper. It is worth saving these page layouts just as they are so as to avoid the need to recreate one every time you need it.

Now to start in earnest! Click on Menu and make sure you are in Select mode. You can banish the Toolbox so as to see the whole of the work area. Drag the previously prepared text file from its

directory window right onto the Draw window, then enlarge this window to full size. Use the window control icons to make the mini-page visible as well, and hide any other windows in the same way.

You will probably be surprised to find that the columns of text which appear have, in all probability, totally ignored your column guidelines. This is normal. If you click once on any piece of text you will see a red dotted rectangle surrounding the whole of the text area created. Double clicking on a section of text similarly reveals the column containing that piece of text.

To adjust any column proceed as follows. Point to the little bit of text you can see, and click Select repeatedly until you get a dotted red outline (with two "ears") round the column you're interested in. You can now move this column or resize it as you would when drawing rectangles (using your preset guidelines if present). Click on Adjust, and the outline disappears from the column you're pointing at. You'll see how the text fills up the available space, and you can play with the sizes of the columns until you have the balance you want. The dotted red outlines appear on the mini-page as well, and in some cases it is easier to do the moving and reshaping in rough here, as you can see the whole page at once. Then you can "fine-tune" on the full-size image.

Remember that unlike genuine DTP packages you can only work with one sheet of paper. If you want to create a multi-paged document, you will need to create separate text files for each page. This is helped by the fact that text can be exported from Draw back to a file. So create your text, and lay it out on the page. Then re-edit the original text file to create the text for the second page and proceed with that and so on. Saving text from Draw is achieved by selecting *Text area* from the *Save* menu (but select the whole text area first).

To fit in a picture, use two text sections, one above and one below the space reserved. Unless you're using a scanner, or pictures from disc, it's probably easiest to leave a space for graphics and stick them in later with glue. However, you can easily create borders, lines and more using Draw.

When your document is complete with text and artwork, save it as a standard Draw file.

Finally you need to print your work. Once I had some text in Draw, I wanted to assess the results, so I installed the dot-matrix printer driver from the Desktop and tried to print from the Draw menu. Masses of line feeds and a few lines of garbage ... not much use! I saved the file and tried again, by dragging the file onto the printer icon on the desktop icon bar. Same result. This was where I nearly gave up. Those of you in the know will think me incredibly stupid, but from the little I'd read in the reviews, I thought it was that simple.

For those users who, like me, haven't used the RISC OS printer drivers before: you have to select a driver to suit your particular printer! You do this by clicking Select (no, NOT Menu) on the printer icon when you have installed it on the desktop icon bar. A dialogue box appears, and you can cycle through a list of printer drivers by clicking Select (forwards) or Adjust (backwards). I ended up with the highest resolution on offer: 240 x 216 dots per inch. It is the slowest, but provides the best quality, which is particularly important when using small font sizes.

By the end of it all, I had a tremendous feeling of satisfaction as a result, I think, of having turned Draw to good use, and because I had to do quite a lot myself. I hope you enjoy this as much as I did. Good luck!

Note: The quality of printout produced in this way depends solely on the type of printer used.

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We would be interested to hear from other RISC User readers who feel that they could usefully contribute to our series, *Into the Arc.*

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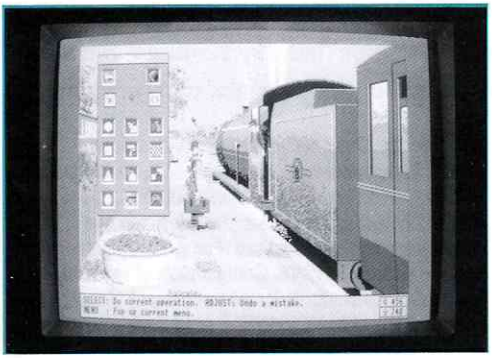
Clares' Artisan 2

Reviewed by Mike Williams

Artisan was one of the first art packages released for the Archimedes (reviewed in RISC User Volume 1 Issue 1), and unlike many others released in those early days has stood the test of time. Indeed, its success has been sufficient to persuade Clares that a new version was warranted. So what does Artisan 2 have to offer both existing users (of Artisan) and potential first time purchasers?

First and foremost, Artisan 2 is a full RISC OS application running in multi-tasking mode, but Clares has resisted the pressure to put the main painting area within a window. Instead the full screen display is still used, which many may feel is a good move anyway. It certainly avoids the need for any scrolling to see the whole picture, but by the same token the picture size is limited by the screen size, and it is, of course, impossible to see two or more pictures (or parts thereof) on screen at the same time.



New Artisan 2 demo screen showing main menu

This is not to say that Artisan 2 avoids windows altogether. Certain sub-menus, for example the filing sub-menu, generate standard Wimp windows. Control is by way of pictorial menus as before. However, Clares has bowed to the weight of pressure, and menus no longer disappear the instant the pointer moves off the menu, but only when the user starts performing the selected function. This is an improvement, but I found that on occasion the menu covered vital areas of the current picture as I was about to commit brush to paper, a characteristic I found disconcerting. Yes, the menu can be moved, but I would prefer to select my painting function positively, so that the menu then disappeared. Although Clares says it has carried out extensive user research, I feel that this is really a matter of personal preference. Perhaps the best solution would be a more flexible approach, permitting users to choose the system which suits them best. In fact, Artisan 2 allows the user to revert to the original style of menu operation, if preferred.

The new Artisan provides much the same facilities as the original (still using mode 12), with a variety of brushes, sprays and other colouring and drawing functions. However, new or extended features have been added to most options. For example, the *Fill* function now allows sprite, circular and graduated line fills. The so-called *transparent* colour allows as many colours to be selected for this feature as required.

There are three new sprite functions. You can cut out irregularly shaped sprites, and a sprite *mask* allows drop shadow effects to be produced which mirror the sprite shape. The *distort* function is completely rewritten, and now works with the current sprite, allowing this to be distorted over any closed shape. A *scaling* option also allows sprites to be scaled and reproportioned as required.

Saving and loading of pictures (and sprites) can now be accomplished by *dragging*, but the filing menu window has been retained for compatibility. I am not sure why this should be so, as the print menu has completely disappeared in

favour of the standard RISC OS printer drivers (copies of which are included on disc) and printing techniques. An additional utility supplied by Clares now allows either process or spot colour separations to be produced.

One feature introduced to meet teaching needs is the facility to restrict the range of painting functions available to a user, so that children do not encounter unexpected and unwanted features.

Artisan 2 is packaged up in Clares' new colourful and glossy style, with two discs and a completely new 90 page manual. A (disappointingly) small number of new demo screens is supplied as well. However, I do not like Clares' current fad for gluing the back cover of the manual into the packaging, nor do I like the use of colour coding for security every time Artisan 2 is loaded.

At £59.95 for the complete package, Artisan 2 is an excellent introduction to the world of painting by computer, but the upgrade price of £30 for existing users seems just a little high (bearing in mind the £39.95 cost of the original). And remember that Clares' Pro-Artisan now costs £99.95. Potential first time purchasers should also consider *Art Nouveau* from Computer Assisted Learning Ltd (reviewed in RISC User Volume 2 Issue 5) which costs just £42.50 inclusive.

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Using Laser Printers
The Panasonic KX-P4450

by Lee Calcraft

The Panasonic KX-P4450 is a middle of the range LaserJet compatible laser printer. It is supplied with a number of emulation modes, and comes with ten resident fonts. Unfortunately of the ten, eight are different sizes of Courier. The other two are proportionally spaced Schoolbook - see figure 1. However, more fonts may be added either by downloading, or by using a font cartridge. The basic laser engine is relatively fast, with a rating of 11 pages per minute. The standard 4450 comes with only half a meg of RAM, but this is upgradable to 1.5Mbytes at a cost of around £340 inc. VAT.

Courier 12 pt
Courier 12 pt italic
Courier 10 pt
Courier 10 pt italic
Courier 8 pt
Courier 8 pt italic
Courier 7.2 pt
Courier 7.2 pt italic
Century 10 pt
Century 10 pt italic

Figure 1. The 4450's ten resident fonts

The whole unit is well packed, and comes with a nicely finished manual which is very helpful on setting up the printer, renewing the toner, etc., but which becomes unhelpfully terse when it comes to making use of the printer's many features by sending control codes.

The 4450 is not the smallest of laser printers. It weighs a hefty 56lbs, has a largish footprint of 16in by 18in, and stands some 14in high. In addition you need a clear 12in or so to the right of the printer for the paper trays. Two come as standard, and there is also an optional envelope feeder for printing directly onto envelopes of up to 90gsm - but there is no single-sheet feed mechanism for one-off items.

The paper feed in the 4450 is from right to left along the bottom of the printer, and by the time that the paper reaches the left hand end, all printing functions have been completed. The paper is then sent upwards, and over to emerge face down on a tray at the top of the machine. This means that a set of pages will emerge in the right order, and without the inconvenience of a collection tray protruding at the left of the printer, albeit at the cost of a slightly convoluted paper path. However, in several months of use I have only had one paper jam, and this was easily cleared, since access to all parts of the paper path is easily achieved.

CONSUMABLES

In some laser printers all consumable items, including the toner and the light sensitive drum, are housed in a single cartridge which can be replaced in a matter of seconds. In the 4450 this is not the case. Toner is supplied in a plastic bottle, and

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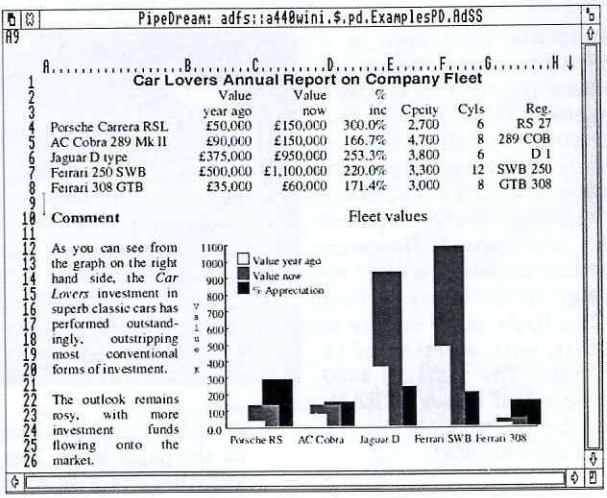
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must be carefully shaken into the toner reservoir when the LCD display tells you that a top-up is needed. You must also replace the used toner collection bottle and roller cleaning pad, and clean the fuser and pinch rollers. All the parts needed for this are supplied in the toner pack.

Toner costs around £34 a pack (inc. VAT), and lasts for around 1500 pages (at 5.5% average paper coverage per sheet). This works out at around 2.3p per copy for toner alone. The light sensitive drum should have a life of some 13,000 copies (cost £169 inc. VAT, giving 1.3p per page), and again the LCD display informs of the need to change this. Additionally the developer unit will need changing every 20,000 pages (cost £130 inc. VAT, giving 0.7p per sheet). This takes the cost of consumables to a little over 4p per sheet, apart from the cost of paper.

The advantage of the 4450's approach to these consumables is that because they are only changed when necessary, running costs should be kept down. However, a standard Canon cartridge (as used by the Apple LaserWriter, and other Canon engines), is good for around 3000 copies. It contains all consumables, and costs about £90. This yields a cost per sheet of only 3p, again excluding the cost of paper. Moreover, loading the toner reservoir on the 4450 can be a messy job if you are not very careful.

The 4450 has a first class user interface in the form of an 18 character LCD display and an extensive bank of selection buttons. These permit a vast number of options to be set up by hand, many of which can be permanently stored as defaults if the user so wishes. Some of the cheaper laser printers use more primitive LED displays, with only very limited option selections. In such cases, the information reported back to the user is in the form of an unreadable symbol which must be looked up in the manual. But with the LCD display on the 4450, if it needs more toner, or a 30,000 page service, it tells you so.

CHARACTER MODE

Connecting the printer to the Archimedes is simplicity itself. The 4450 has both serial and parallel interfaces. The latter uses a standard Centronics connector and provides the most efficient link with the Arc. With the lead connected, you can send data straight to the printer by sending VDU2 (or Ctrl-B) to send the Arc's output through its printer port, and using PRINT statements. Before you do this, you need to set two options from the printer's front panel:

Set CR to CR - LF (set carriage returns to generate a carriage return line feed sequence)
Set Emulation mode to Epson

Incidentally, the 4450 has an excellent status printout option (press "Test" then "Enter"), printing out a whole page of status information about the current settings. With the above settings made, you can treat the 4450 as if it were a high quality Epson printer.

You can print out Basic program listings by pressing Ctrl-B, then typing LIST, then Ctrl-L followed by Ctrl-C. When using a laser printer you must remember that you will get no output until the printer receives a whole page (or is given to believe that the page is complete), so if you send less than a page, no paper will emerge from the printer. You can get around this by using Ctrl-L to send a form feed to flush out the final page as in the example above, or contrive to send the correct number of lines to constitute a whole number of pages. Alternatively, you can take the printer off line from the front panel, and click on the "Print" button.

You will see from the timings in figure 2 just how fast the 4450 is in Epson text-printing mode. It prints 11 pages per minute, and each page could contain over

4000 characters. Moreover the first page through only takes 18 seconds, which is a relatively short overhead. Quality, as you can see from the sample in figure 1, is very good. The only proviso here is that the supplied fonts are very limited, and that emboldened characters tend to be a little too heavy.

Character mode (Epson emulation)		
First page out		18.7 secs
Each subsequent page		5.5 secs (yielding 11 pages per min)
Graphics mode (LaserJet emulation)		
Standard Draw file (150 dpi)		47 secs
Standard Draw file (300 dpi)	3 mins	31 secs
Mode 12 screen (150 dpi)		55 secs
Mode 12 screen (300 dpi)	2 mins	29 secs

Figure 2. KX-P4450 timings for Epson character mode, and LaserJet mode (printing the standard Draw file from Applications 1 disc, and an Archimedes mode 12 screen)

Finally, a word of warning to those using character mode. If you are using the 4450 in conjunction with a word processor, you will need to know the number of characters per line, and the number of lines per page that your printer is set up for. By default you will find that it is (unexpectedly) 65 lines per page, and 76 characters per line (in 12pt Courier). But you can save yourself a lot of time if you test this out first. Also, be careful not to send "Cancel Skip-perforations" codes in Epson mode, since this can result in loss of output at the top of the page.

LASERJET MODE

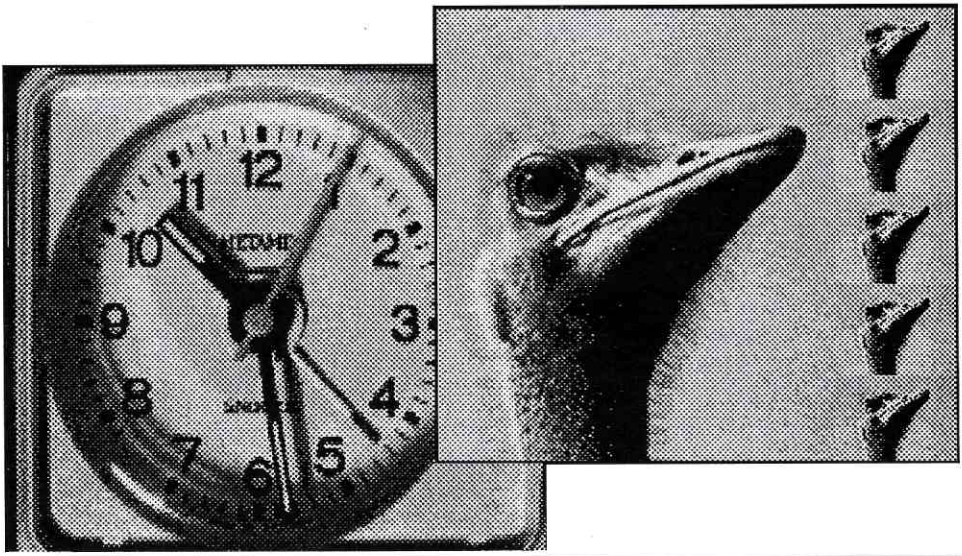
With Archimedes software which uses the printer drivers, such as Paint, Draw, Impression etc, you will obtain best results by selecting the Panasonic LP emulation mode from the front panel. This emulates the HP LaserJet, and you should install the LaserJet driver on the Desktop. Now, with all output except for ASCII files, the LaserJet driver will prepare a bit image pixel-by-pixel of the required output, and send this to the printer. This will be transferred to the printer's internal RAM, and then, when the whole page is in place, it will be printed.

In LaserJet mode, the user has a choice of output quality. This is selectable from the Arc's printer driver (use Select on the driver icon on the icon bar). Using 150 dpi (dots per inch) gives quite reasonable draft quality at a fair speed, while 300 dpi will give you a very high quality result indeed (see figure 3), but will take more than four times as long (see figure 2). Interestingly, of these two timings, only the last 18 secs or so of each is spent by the laser printer. For the rest of the time, the Arc's printer driver is generating an output image in suitable format.

Apart from its inherent slowness, another problem with the 300 dpi setting is that a page of A4 needs more than half a megabyte of RAM to hold it. Thus if you have a full A4 page of text to be output at 300 dpi, but have not upgraded the 4450's RAM, it will print the first two thirds or so of the page, and flash up an error message. You can then press the "Print" button to print the remainder of the page on a second sheet.

The machine also gives excellent results with halftone graphics, such as digitised pictures or screen dumps. This is partly due to the quality of the printer, which holds its solid blacks very well, and partly due to the printer driver software, and modules such as ColourTrans which are used extensively in translating coloured images to halftones. Of course, laser printers cannot output anything but black dots (albeit very small ones). To create a grey halftone, a suitable dot pattern must be used. This means that definition must inevitably suffer, but if you take a close look at figure 3, you will see just how good the final result can be.

The Panasonic KX-P4450 costs £1499 inc. VAT from BEEBUG.



Text in 14 pt Trinity Medium

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Figure 3. The quality of text and graphics output from the 4450 at 300 dpi is excellent

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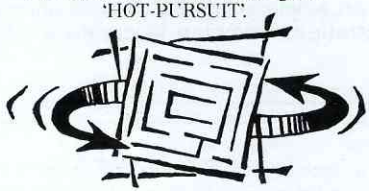

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Assembler Workshop

David Spencer takes a close look at register R15.

In this month's assembler workshop we shall take a look at the role of register R15 in ARM instructions. The ARM processor features an *orthogonal* instruction set, which means that R15 can appear in instructions just like any other register. However, as we will see, R15 is unlike the rest of the registers in other respects.

WHAT MAKES A REGISTER?

Unlike the other registers in the ARM processor, R15 is totally dedicated in its use. The register is split into two parts, each with entirely separate functions. The first part, consisting of bits 2-25, makes up the *Program Counter* (PC), while the remaining bits form the *Processor Status Register* (PSR). The PSR is in turn split into six flags, and a two-bit value indicating the processor mode (more of which later). This is shown in figure 1.

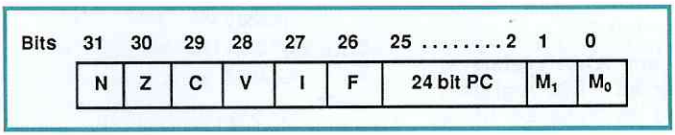

Figure 1. The layout of register R15

The program counter is used to hold the address of each ARM instruction being executed. The ARM address bus is twenty six bits wide, and therefore you might expect the program counter to have to be twenty six bits in order to address the full range of memory. However, this is not the case, as the ARM processor insists that all instructions are word aligned. Hence, the two lowest bits of the instruction address will always be 00, and as such don't need to be stored. If you look again at figure 1, you will see that the bits in R15 making up the program counter are offset two bits into the register (in other words, the lowest bit of the PC is in bit 2 of R15). This means that if just the PC bits of R15 are extracted by ANDing the register with &3FFFFFC, then the result will be the correct address.

PIPELINING

One effect that must always be remembered when considering the contents of the program counter is *pipelining*. There is not room here to explain this in detail, but its effect is that while a particular instruction is being executed, the address held in the program counter is eight bytes ahead of the address of the instruction itself (or twelve ahead for LDM - see later).

THE PROCESSOR STATUS REGISTER

Before looking at the use of R15 in instructions, we will take a brief look at the flags that make up the PSR. N, Z, C and V are the Negative, Zero, Carry and oVerflow flags, and are set by the data processing instructions to reflect the status of the result (for instance whether it was zero or not).

The I and F flags are used to disable interrupt requests (IRQ) and fast interrupt requests (FIQ) respectively. More on interrupts can be found in the article *Under the Lid* elsewhere in this issue.

Finally, for the PSR, bits zero and one indicate the current processor mode. This will be explained fully in a future *Assembler Workshop*, but for now it is sufficient to know that these bits are normally 00, indicating the processor is in User Mode. However, while executing operating system routines, such as SWIs, these bits are set to 11 to indicate Supervisor Mode. Further more, these

modes bits themselves, and the I and F flags, cannot be changed in User Mode.

A final point worthy of noting is that R15 is usually referred to in instructions as 'PC', although it does in fact contain both the program counter *and* the status flags.

USING R15 IN INSTRUCTIONS

We can now consider the effects of using register R15 in ARM instructions. There are five basic classes of ARM instruction - data processing, branch, memory transfer, multiple transfer and SWI. We don't need to consider SWI and Branch any further, as although they both alter R15, they do so implicitly.

We will start with the data processing instructions, such as ADD and MOV. The general syntax for these is:

```
<op> Rd,Rn,Rm
```

However, for MOV and MVN, Rn is absent, while for the comparison operations (TEQ, TST, CMP and CMN), Rd is not specified.

Rd and Rn can be any ARM registers, while Rm is either an ARM register, optionally shifted or rotated by a constant or further register, or an immediate value. We are interested in the case where R15 is used for any of Rd, Rn and Rm.

The rules the ARM employs in these cases are simple. If Rm is R15, then all thirty-two bits of the register are used, in other words both the PC and PSR. On the other hand, if Rm is R15, then only the PC bits are used, and the PSR bits are seen as zeros by the instruction. For example,

```
MOV R0,PC
```

will copy *all* of R15 into R0, while,

```
ADD R0,PC,#0
```

will leave R0 containing just the PC bits from R15. In both cases, the PC will be eight bytes ahead of the instruction address, because of pipelining.

The effect when Rd is R15 depends on whether the 'S' flag is present in the instruction. Normally, this flag is used to reflect the result of an arithmetic operation in the PSR flags. However, when the destination register is R15, the S flag determines whether all of R15 is updated (with S present), or just the program counter bits (without the S). For example, the instruction:

```
MOV   PC,R14
```

will 'jump' to the address in R14, leaving the flags unchanged, while:

```
MOVS  PC,R14
```

will perform the same jump, but will replace the flags with the corresponding bits in R14.

One instance where using R15 in an ADD instruction is very useful, is when jumping to one of a set of routines depending on the contents of a register. This can be realised using the following code:

```
CMP    R0,#entries
ADDCC  PC,PC,R0,ASL #2
B      outofrange
B      option0          ;x
B      option1
B      option2
  etc.
```

Assuming that R0 contains the number of the routine to call, starting at zero, the first instruction checks that it is in the correct range (where *entries* is the number of table entries). Assuming it is alright, the ADD instruction will add the entry number times four to the program counter, which at this time points to the instruction labelled x. It should be easy to see that this will skip to the appropriate branch instruction which in turn jumps to the actual routine. If the value was out of range, then the branch after the ADD is executed instead. Such code is frequently used to dispatch SWI calls within a module.

The comparison operations (TEQ etc.) have a final trick up their sleeves. Normally, these instructions use the

flags to reflect their result. For example, TEQ will set the Z flag if the two arguments are equal. However, if the instruction is followed by a 'P', the effect is changed so that the result of the operation (which is normally discarded) is written directly to the PSR flags, without affecting the program counter. To understand this, consider the following:

```
MOV    R0,PC
ORR    R0,R0,#1<<29
TEQP   R0,#0
```

The first instruction copies all of R15 (PC and PSR) to R0. The ORR instruction then sets what was the carry flag. To understand what happens next, we need to understand how TEQ works. This instruction performs a comparison by Exclusive ORing its two arguments. If they were equal, the result will be zero, and the Z flag will be set. The result itself is normally discarded. However, as stated above, the 'P' modifies the operation so that the Exclusive ORing is still performed, but the result is written directly into the PSR flags of R15 on a bit by bit basis. The net effect of this is that all the flags will be rewritten with their original values, except for the carry flag which will be forcibly set as a result of the ORR instruction.

Moving on to the load and store instructions, LDR and STR, these can use R15 as the register being transferred, the base register, or the offset register. The only useful form is when R15 is the base register, for example:

```
LDR    R0,[PC,#100]
```

This allows a transfer of data from an address that is relative to the current instruction. Such an operation is called a *program relative transfer*. In practice, a simpler form of instruction is used, for example:

```
LDR    R0,data
```

where *data* is a label elsewhere in the program. The assembler will translate this into an appropriate instruction of the form given above, automatically taking into account the effects of pipelining.

The final class of instructions consists of the multiple load and store operations - LDM and STM. These take the general form of:

```
LDM/STM Rb[!],{reg list} [^]
```

where *reg list* is a list of ARM registers, and the ! and ^ qualifiers are optional. The base register, Rb, cannot usefully be R15, as the ARM uses all thirty-two bits. This means that unless all the flags are reset, the interrupts are enabled, and the processor is in user mode, an address exception would occur. R15 can however appear in the register list. In the case of STM, all thirty-two bits of R15 will be saved. However, because of the effect of pipelining, the program counter that is saved points twelve bytes ahead of the STM instruction itself. In general, STM instructions that save R15 are not used a great deal. On the other hand, loading R15 with an LDM instruction can be very handy. The main use is to return from a subroutine, where the return address is saved at the start using:

```
STMFD R13!,{R14}
```

and a return from the subroutine is performed using:

```
LDMFD R13!,{PC}
```

This has the effect of reloading the program counter with the value on the stack, leaving the status flags unchanged. If the optional '^' is used with the instruction, then not only is the program counter loaded, but also the flags. This is very useful for restoring the flags to the state that they were at the start of a subroutine.

CONCLUSION

While the orthogonality of the ARM instruction set allows R15 to be used in almost any instruction, the main uses are those described above. Understanding the possibilities of using R15 can, however, often allow more elegant and efficient code to be written. RU

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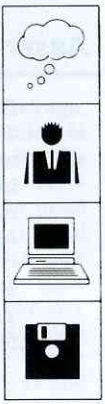

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Probing Pascal

David Spencer gives a brief overview of the Pascal language, and takes a look at the two compilers available for the Archimedes.

To some people Pascal is the ideal programming language, while others see it as little more than a toy. To understand these opposing views we need to look at the nature of Pascal. When the language was first developed in the late sixties, the main languages in use were Fortran and Basic, both of which lent themselves more to spaghetti programming than the doctrines of structured programming which were emerging. Pascal's inventor, Niklaus Wirth, recognised that there was a need for a language which could be used to implement algorithms directly, without getting bogged down in the pragmatics of that particular language. With this in mind, Wirth invented Pascal as a highly structured, totally machine-independent, language.

With its features of machine independence and closeness to theoretical algorithms, Pascal makes an excellent teaching language. For this reason, Pascal tends to be loved by academics, but frowned upon by real-life programmers who see it as too 'simple' to cope with the needs of practical applications.

STANDARD PASCAL

A few years ago, a standard version of Pascal was defined in an attempt to improve portability, much as with C today. This definition is known as ISO7185 in America, and BS6192:1982 in this country. Unfortunately, the standard only defines a minimal version of the language, and most real compilers add numerous extensions, immediately defeating the object of a standard. As an example of this, the file handling defined in the standard doesn't provide a very satisfactory way of accessing actual files on disc. Instead, files are thought of as temporary entities that exist only for the duration of execution, and even then only sequential access is possible. Needless to say, file handling is one of the areas in which all Pascal compilers offer some extensions.

There are in fact two levels to the standard. Level 0 is the basic definition, while level 1 adds an extra concept known as a Conformat Array Parameter (CAP). This is a special mechanism that allows functions to be written that can take arbitrary sized arrays as parameters. Without CAPs, the syntax checking is so rigid that the dimensions of each array parameter must be specified at compile-time.

COMPILERS

There are currently two Pascal compilers for the Archimedes. The first of these is the official Acorn ISO-Pascal, which is now in its second version, and the other is the new Cambridge Pascal from Dabs Press.

Both of the compilers support the BS6192 standard version of the language, although only the Acorn one features the optional CAPs. Both compilers also offer similar extensions, mainly to deal with string handling, graphics and operating system calls. Cambridge Pascal has the additional feature that it can be used to compile relocatable modules, allowing new star commands to be written in Pascal. ISO Pascal, on the other hand, compiles into Acorn Object Format (AOF) which means that a program can include routines written in ARM Assembler or C. However, there are a few problems with this, all of which are detailed in the user guide.

USING THE COMPILERS

In use, the two compilers are quite different. ISO-Pascal is entirely command-line driven. This means that each time you want to compile a program you must exit to the command-line prompt, compile the program, and then link it with the

Pascal library to obtain an executable program. As the compiler, linker and library have to be loaded off disc each time, this can be quite time-consuming.

Compiler	Compilation Time	Execution Time	Length
ISO Pascal	30s	3s	33K
Camb.Pascal	2s	5s	1464 bytes*

* Plus 17K for library module

Table 1. Timing for Sieve of Eratosthenes for all primes up to 7000.

Cambridge Pascal, on the other hand, exists as a relocatable module and can be run from the Desktop. All you need do to compile a program is drag the source file to the compiler icon on the icon bar, drag the object file icon to wherever you want the code to be saved, and sit back while the compilation takes place. This process is, however, not multi-tasking; instead, the compilation takes places in a command window, with all other tasks suspended. The resulting object code is also shorter than that produced by ISO-Pascal, as they make use of a module-based library which is loaded in at the same time as the compiler. A dialogue box allows the various compiler options to be changed, and finally, you can still run the compiler from the command-line if desired.

One problem with the Cambridge Pascal setup is the amount of memory used. As it is loaded as a module, memory is used for this, as well as the library module. This takes up about 225K of memory which cannot easily be recovered without a hard reset once it has been claimed. As ISO Pascal is loaded from disc each time, it only takes up memory when actually in use.

PERFORMANCE

Table 1 gives timing for compilation and execution of a sample program with both compilers. Each system offers a number of 'speed-up' options, such as disabling Escape checking during execution. For the purposes of these timings, both compilers were set up to offer the same features. You can see that Cambridge Pascal is much faster at compiling, but slower at execution than ISO Pascal.

DOCUMENTATION

Cambridge Pascal is supplied with a 58 page user guide, while ISO Pascal has two user guides - a main one of 136 pages and a 34 page update. The manuals for both systems document the use of the compiler, the extensions and the various error messages and warnings. Despite its greater length, I found the Acorn manual rather terse, and it always seemed to stop short of explaining any subject fully. It can also be very confusing always to have to cross reference the update guide for any additional information.

Cambridge Pascal also includes a large number of example programs on the disc, while ISO Pascal just has the obligatory 'Hello World' program. Not only do these programs give you something with which to get started, but they also illustrate all the extensions of the language.

Neither compiler includes any details on programming in Pascal. However, this is not a problem, as the widespread use of Pascal in teaching ensures that a visit to any computer bookshop will reveal a plethora of suitable tutorial guides.

CONCLUSION

Despite the features offered by both compilers, I can't see many people using Pascal for serious software development. Instead, I think the people most likely to use Pascal on an Archimedes are students, for whom the language frequently makes up the bulk of first-year programming courses. Therefore, I feel that the prime qualities that these compilers will be judged on are ease of use, and adherence to the ANSI standard, although some extensions are important,

such as those for file and string handling. Cambridge Pascal has to win on ease of use, as programs can be edited, compiled and executed without leaving the Desktop. On the other hand, ISO Pascal pips its rival at the post on ANSI compatibility, as it supports the full level 1 standard. The other consideration is of course cost, and with Cambridge Pascal over £30 cheaper than Acorn ISO Pascal, the Dabs Press product has to come out the overall winner in my view.

Product	*ISO Pascal*
Supplier	*Acorn Computers Ltd., Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN. Tel. (0223) 245200*
Price	*£113.79 (inc. VAT)*
Product	*Cambridge Pascal*
Supplier	*Dabs Press,5 Victoria Lane, Whitefield, Manchester M25 6AL. Tel. 061-766 8423*
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A Check Save Module

Peter Arnold describes a short utility which can prove invaluable in preventing the accidental overwriting of files.

The short module listed here provides a useful function, particularly for program developers, but others as well. Whenever a *save* function is to be performed, the utility, once installed, checks to see if any file with the same name (and pathname) already exists, and if so seeks confirmation from the user before proceeding. This can be invaluable for preventing the inadvertent overwriting of files, whether saved directly (from within Basic or from the command line, for example), or from the Desktop (by dragging). In the latter case, pressing the Select button confirms ('Y'), while any other button cancels.

The utility is supplied in the form of a module called *RMCheck*, which can be assembled by entering and running the program listed here (but do save the source code before running it). It would also be advisable to save a copy of the original program once entered (use the name *CheckSave*) in case any mistakes have occurred. Once the module has been created, it can be installed by double clicking on its icon in a directory viewer, or by typing:

```
*RMLOAD RMCheck
```

in response to the system prompt (*).

Once loaded, the module is immediately active. However, two star commands have also been provided, **CheckOff* and **CheckOn* which may be used to switch the check off, or back on again. The module will also respond to the use of the *HELP command followed by the module name, e.g.:

```
*HELP RMCheck
```

This module is particularly useful to anyone developing programs in Basic, but also in any situation where it is otherwise possible to overwrite a file without realising what has happened until maybe too late.

For those who may be interested in the workings of the program, an annotated version is included on the magazine disc.

```
  10 REM            >CheckSave
  20 REM Program    Save Checker
  30 REM Version    A 1.0
  40 REM Author     Peter Arnold
  50 REM RISC User Jan/Feb 1990
  60 REM Program    Subject to Copyright
  70 :
  80 DIM code% 1000
  90 PROCassemble
 100 OSCLI"SAVE RMCheck "+STR$~code%+"+
"+STR$~P%
 110 OSCLI"SETTYPE RMCheck FFA"
 120 END
 130 :
 140 DEF PROCassemble
 150 FOR pass%=4 TO 7 STEP 3
 160 P%=0:O%=code%
 170 [OPT pass%
 180 .Start
 190 EQUD 0:EQUD Init
 200 EQUD ReleaseVector
 210 EQUD Service:EQUD Title
 220 EQUD Help:EQUD Comms
 230 .Title
 240 EQUS "CheckSave"
 250 EQUB 0:ALIGN
 260 .Help
 270 EQUS "Save Checker"+CHR$9+"1.00 ("
+MID$(TIME$,5,11)+")"
 280 EQUB 0:ALIGN
 290 .Comms
 300 EQUS "CheckOn":EQUB 0
 310 ALIGN:EQUD Checkon:EQUD 0
 320 EQUD Onsyn:EQUD Onhlp
 330 EQUS "CheckOff":EQUB 0
 340 ALIGN:EQUD Checkoff:EQUD 0
```

```
  350 EQUD Offsyn:EQUD Offhlp
  360 EQUB 0
  370 .Onhlp
  380 EQUS "CheckOn turns on save checki
ng"
  390 EQUB 13
  400 .Onsyn
  410 EQUS "Syntax: *CheckOn"
  420 EQUB 0
  430 .Offhlp
  440 EQUS "CheckOff turns off save chec
king"
  450 EQUB 13
  460 .Offsyn
  470 EQUS "Syntax: *CheckOff"
  480 EQUB 0
  490 .Checkon
  500 LDR R12,[R12]:MOV R0,#1
  510 STR R0,[R12]:MOV PC,R14
  520 .Checkoff
  530 LDR R12,[R12]:MOV R0,#0
  540 STR R0,[R12]:MOV PC,R14
  550 .Service
  560 STMFD R13!,{R14}
  570 CMP R1,#&27
  580 BLEQ ClaimVector
  590 LDMFD R13!,{PC}
  600 .Init
  610 STMFD R13!,{R14}
  620 MOV R0,#6:MOV R3,#1
  630 SWI "OS_Module"
  640 STR R3,[R2]:STR R2,[R12]
  650 BL ClaimVector
  660 LDMFD R13!,{PC}
  670 .ClaimVector
  680 STMFD R13!,{R0-R3,R14}
  690 MOV R0,#8:ADR R1,CodeStart
  700 LDR R2,[R12]:SWI "OS_Claim"
  710 LDMFD R13!,{R0-R3,PC}
  720 .ReleaseVector
  730 STMFD R13!,{R14}
  740 MOV R0,#8:ADR R1,CodeStart
  750 LDR R2,[R12]:SWI "OS_Release"
  760 LDMFD R13!,{PC}
  770 .CodeStart
  780 STMFD R13!,{R0-R12,R14}
  790 LDR R6,[R12]:CMP R6,#1
  800 BNE Exit
  810 CMP R0,#0:CMPNE R0,#10
  820 BNE Exit
  830 MOV R0,#5
  840 SWI "XOS_File"
  850 CMP R0,#0:BEQ Exit
  860 MOV R9,R1:SWI "OS_WriteS"
  870 EQUS "File exists - Overwrite (Y/N
) ?"
  880 EQUB 7:EQUB 0:ALIGN
  890 BL Entry
  900 .Access
  910 AND R1,R5,#8:AND R2,R5,#2
  920 ORR R1,R1,R2:CMP R1,#2
  930 BEQ Exit
  940 SWI "OS_WriteS"
  950 EQUS "Insufficient access - Contin
ue? (Y/N)"
  960 EQUB 7:EQUB 0:ALIGN
  970 BL Entry
  980 MOV R1,R9:MOV R0,#4
  990 MOV R5,#51:SWI "OS_File"
 1000 .Exit
 1010 LDMFD R13!,{R0-R12,PC}^
 1020 .Nosave
 1030 SWI "OS_WriteS"
 1040 EQUS "Save abandoned"
 1050 EQUB 0:ALIGN
 1060 SWI "OS_NewLine"
 1070 LDMFD R13!,{R0-R12,R14}
 1080 LDMFD R13!,{PC}
 1090 .Entry
 1100 MOV R7,R14:SWI "OS_Confirm"
 1110 SWI "OS_WriteC":SWI &10D:SWI &10A
 1120 BCS Nosave:BNE Nosave:MOV PC,R7
 1130 ]:NEXT
 1140 ENDPROC
```

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Hyperbook

Reviewed by Mark Sealey

INTRODUCTION

Hyperbook is the result of the collaboration between the world's fifth largest book publisher and one of the most successful BBC/Acorn software houses. Longman, in fact, has recently merged its software division with the "serious" (i.e. non-games) side of Logotron. This product is one of the first to appear since the merger.

Hyperbook is a text retrieval system which will have appeal far beyond the educational market (for which Logotron is best known), and the software also runs on the RM Nimbus and on PCs and compatibles. As a package, Hyperbook consists of two components: the *reader*, and the text files on which this works. To date files in social, religious, historical, geographical, economic, environmental, scientific, literary and political fields have already become available.

The ten titles which make up this output are reasonably priced and cover a range of (mostly topical) interests. Given the amount of data, which is stored in compressed format - typically 320 screen 'pages' on one 800K disc - these represent good value for money.

USING HYPERBOOK

Because this first version of the software necessarily has one eye on compatibility with other hardware systems, there are no concessions to the RISC OS Desktop, although a Wimp system of sorts is employed. Menus are pulled down from the top of the screen, most of the rest of which is occupied by the text.

These menus concern Filing, Glossaries, Vocabulary, Output and the ubiquitous Miscellaneous, as well as one other of some importance, Indexes. The documentation is clear, easy to follow and unambiguous, guiding the user around all of these facilities.

Two functions require a little explanation. As well as being able simply to read text, print it, spool it to a word processor or just browse with all the usual cursor key and Page Up/Down conventions, you can compile, edit, save and load so-called *glossaries* which augment the basic text.

In similar vein, *vocabularies* are used to search a range of pages within a text for a variety of purposes, notably to draw a user's attention to just those unfamiliar words which you might want to deal with later in a glossary. Each glossary entry is limited to a maximum of 90 characters.

These functions are typical of the well thought-out and logical design of Hyperbook, which is also reflected in the menu system.

INDEXES

Hyperbook, then, can scan text, provide lexical information, and print out either, (and if necessary allow access to the operating system). Most of this mirrors more or less what would happen if you were using a printed book and moving backwards and forwards through its text in a conventional manner.

Hyperbook's main claim to fame lies in a very substantial extra feature to normal text use: the *Index*. It is harder to describe how the Hyperbook index system works than it is to use it.

A Hyperbook index is essentially different from that of a printed book in that it is not necessarily linear. Even the most well-indexed reference book could scarcely pick out every occurrence of every word, but Hyperbook can.

More usefully, though, imagine a hypothetical text file published on the general subject of microcomputers and loaded into Hyperbook. Every instance of the word 'computer' could effectively be tagged. Hyperbook "multi-tasks" internally with its other activities so that, as soon as one instance of 'computer' is found, it can be located, highlighted on screen and examined in context while the search continues. Other Hyperbook operations (including up to three other searches) can also proceed at the same time with little noticeable slowdown in performance.

By simple use of the cursor, a second and perhaps more specific sub-index can be generated at one level down from the earlier one on 'computer'. This might find every mention of 'Acorn' or of 'BBC'. Selection criteria are essentially Boolean, and permit wildcards too. There can be up to six 'sub-indexes' from each parent.

Conceptually, this second search is located below the catch-all 'computer' one from the user's point of view. This can be enormously useful as it effectively follows the user's thought processes and allows layers of sub-indexes to be created.

Hyperbook has a neat way of determining where a reference begins and ends. The software controls the amount of text (in practice this is likely to be the number of lines) which gets printed either side of the target words. This *extent* setting can be controlled by the user. Typically it will be a number of lines (default +/- 3) either side. But it could be the whole page (maximum) or the minimum of just the line in question.

The same facility can set the extent after one reference is found before a following one is considered as a separate item. This means that texts containing highly repetitive material or lists can be made more manageable.

There are currently ten titles in the catalogue and as many again scheduled for early 1990. The content of the *Economics*, *Social* and *Geographical* Issues discs is necessarily selective. Like the *20th* Century History *release, they provide an* encyclopaedic source for exploration and reference, rather than continuous, sequential reading.

Also available is the *Authoring System* (£17.25 inc. VAT); this allows text from any source (a variety of word processors, for example) to be converted into Hyperbook format.

CONCLUSIONS

Hyperbook is an excellent product, excellently produced. By the side of the relative sophistication and colourful screens of RISC OS, some will say it is a little low-key. In fact, its appeal is none the less for that. It does everything claimed of it well, and is very reasonably priced. Assuming worthwhile titles continue to appear in quantity, it ought to set a new trend in software for the Archimedes.

Product	*Hyperbook*
Supplier	*Longman/Logotron, Dales Brewery, Gwydir Street, Cambridge CB1 2LJ. Tel. (0223) 323656*
Prices	*£56.35 inc. VAT for the Reader, £17.25 to £27.50 inc. VAT for text files, £5.75 inc VAT for a demonstration Green disc.*

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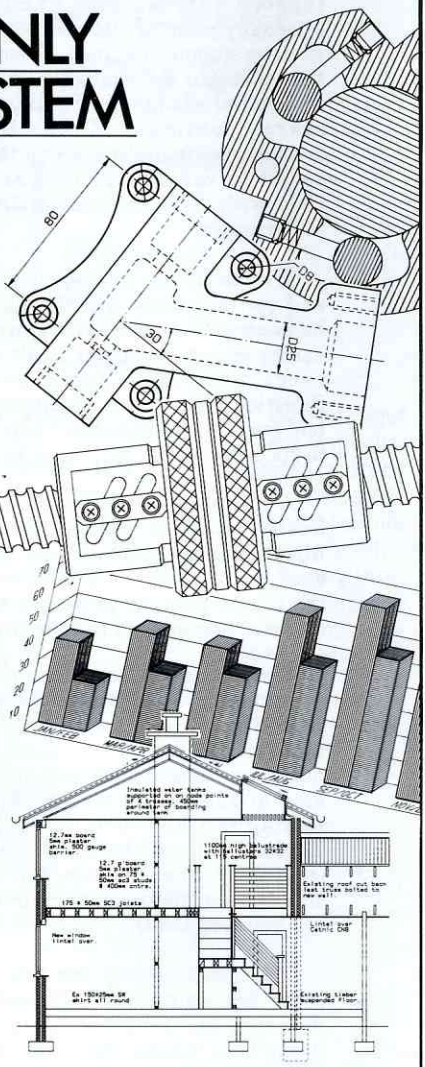

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Mastering the Wimp
Part 5 - Responding to Redraw Requests

by Lee Calcraft

In the series so far we have looked at the way in which Wimp_Poll maintains a dialogue with each active task. When the Wimp_Poll returns a reason code of 2 this constitutes a request by the Wimp to open (or re-open) a particular window. This occurs when the adjust size icon or the title bar icon of a window are selected, or when scroll bars are dragged to a new position.

The usual way for the task to respond to this is to call SYS Wimp_OpenWindow (SWI &400C5), just as we have done in line 450 of our test program from part 1 of the series. This puts the onus back on the Wimp to manage any redrawing of the window which is necessary.

The form of the parameter block returned by the Wimp to accompany a reason code of 2 was given in figure 1 of last month's article. It is exactly the form required when making the Wimp_OpenWindow call, so no data whatsoever needs to be set up by our task. We do not even need to insert the window handle at block% as we have done in our test program - even this is performed for us by the Wimp when it returns a reason code of 2.

In response to our call to Wimp_OpenWindow, the Wimp will begin the business of opening (or re-opening) the nominated window. During this process it checks window flag 4 (see figure 2 from part 3 of the series) - *window needs no help from the task in redrawing the window* - and if this is set, it puts the window on screen. Many windows however, will have bit 4 unset, meaning that the task must be invoked to draw text or graphics in the window.

In such cases (and also when another window uncovers a part of the task's window), the Wimp will return a reason code of 1 (redraw window request) to the task next time around. The task must respond to this in a very special way. It is no good for example for the task to respond by directly drawing text or graphics onto the screen: the window in question might well be partly (or even fully) obscured by another.

Our example program responds to reason code 1 by calling PROCredraw. The Wimp_Poll loop thus takes the form:

```
DEFPROCpoll
SYS "Wimp_Poll",,block% TO reason%
CASE reason% OF
  WHEN 1:PROCredraw
  WHEN 2:SYS"Wimp_OpenWindow",,block%
etc.
```

PROCredraw takes a very special form, as you can see if you take a look at the listing below. It first calls Wimp_RedrawWindow (SWI &400C8), and then repeatedly calls SYS Wimp_GetRectangle (SWI &400CA) until the Wimp says that it has had enough (more% becomes zero).

```
790 DEFPROCredraw
800 REM Redraw Window
810 SYS "Wimp_RedrawWindow",,block% TO
more%
820 PROCgetorigin(block%,x0%,y0%)
830 WHILE more%
840   PROCdraw(x0%,y0%)
850   SYS "Wimp_GetRectangle",,block%
TO more%
860 ENDWHILE
870 ENDPROC
```

What is going on here is that in the first place the task tells the Wimp that it is ready to get on with the job of redrawing (as prompted by the reason code of 1 returned at the last poll by the Wimp). The Wimp then decides upon which parts of the window need redrawing. If the window is uncovered,

then this could be the whole window, but if it is partially covered by other windows, then this could be a series of rectangles which, taken together, add up to the total area on display (see figure 1).

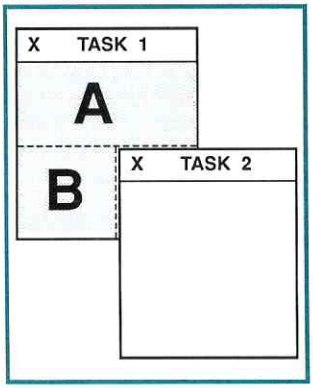

Figure 1. Window Updating. If the Wimp needs to update TASK 1, it will split the area into rectangles A and B, and request in turn that the two be updated.

The Wimp then sets a clipping window (i.e. an old fashioned graphics window using VDU 24) to the perimeter of the first of these rectangles, it clears this area to the background colour (unless the window is transparent), and it sets VDU 5 (write text at the graphics cursor). Finally it fills the parameter block, and returns the task a flag indicating that there is an area to be updated.

The task in its turn redraws that area with whatever text or graphics it requires, and then calls Wimp_GetRectangle, which sets up the next rectangle in the sequence. This continues (with a whole series of calls to Wimp_GetRectangle) until the Wimp has updated all the rectangles in the task window which had become invalid, and the job is complete. If you look carefully as you use the Desktop you will see this process in action. The Wimp updates each semi-obscured window bit-by-bit.

In practice, a task can respond in two different ways to the parameter block returned. The simplest way is to redraw everything in the whole of the task's work area each time that any rectangle is requested. This relies on the clipping window to ensure that only those parts of the window which the Wimp requires will actually be drawn on screen. Of course, if you have a very large work area (as you might with a text editor full of text for example) this approach would be impossibly slow, since the task would need to write the whole text file to the screen every time that the Wimp needed to update even a square centimetre. A much more efficient (and more complex) approach is for the task to narrow down the contents of the work area as closely as possible to that needed for redrawing the segment of window which the Wimp is updating, and draw this only, bearing in mind of course, that if you are dealing with sprites, it is not feasible to split them. For the sake of (relative) simplicity, we will stick with the former approach, referring those interested in the latter to the PRM.

Our test program then, adopts the simple approach. It uses PROCgetorigin to work out exactly where on the screen our window is to be displayed, and then every time that the Wimp asks for a segment of it to be redrawn, it redraws the lot using PROCdraw, relying on the clipping window set up by the Wimp to ensure that only the nominated rectangle is updated each time.

Working out the origin for the redraw is performed very simply in lines 900 and 910 of the program, but explaining the calculation is a little less simple. Take a look at figure 2. This shows the relationship between visible area, work area and scroll offsets. Essentially, the Wimp parameter block available to us contains the visible area minimum and maximum x and y co-ordinates, and the scroll offsets (as well as information on the co-ordinates of the rectangle within the window which needs updating - but which we will ignore), and we need to calculate the work area minimum x and y co-ordinates *in terms of* the graphics origin. Getting the x co-ordinate is easy, we just subtract the scroll offset from the

visible area minimum x co-ordinate. For the vertical dimension we take the *maximum* visible area y co-ordinate and subtract the vertical scroll offset (which itself is measured downwards, and will therefore be negative).

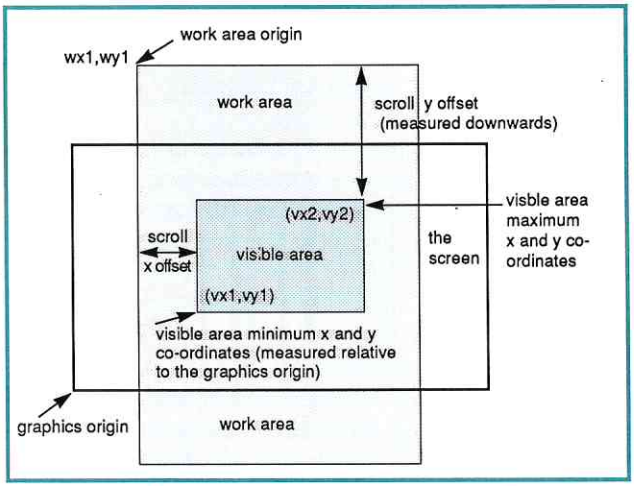

Figure 2. Calculating the origin for window redrawing

With this under our belt we can go about the business of writing to our window. In the example program from part 1, the time and date were written in the window, and a small filled circle drawn. This was accomplished in PROCdraw, defined as follows:

```
 940 DEFPROCdraw(x0%,y0%)
 950 SYS "Wimp_SetColour",11
 960 MOVE x0%,y0%-40
 970 PRINT TIME$
 980 SYS "Wimp_SetColour",10
 990 CIRCLE FILL x0%+100,y0%-400,50
1000 ENDPROC
```

x0% and y0% are the co-ordinates of the origin of the work area, expressed relative to the graphics origin as described above. They refer to the top left-hand corner of the work area.

The calls made to SYS Wimp_SetColour serve to define the current graphics colour. We cannot simply use GCOL for this purpose because this would give a colour dependent upon the currently set mode - and multi-tasking programs should wherever possible work in all modes. The parameter supplied with the call is simply the colour number (0-15) in the Wimp palette. To get an idea of the range of colours available, take a close look at the Desktop palette icon. This contains all 16 colours displayed in numerical order from 0 at the top left to 15 at the bottom right.

The time and date are displayed in our window using the PRINT TIME$ statement in line 970, and since VDU 5 is operative, we must move the graphics cursor to the position on screen where the text is to start - hence the preceding MOVE x0%,y0%-40 statement. Note the way we have *subtracted* 40 from the y co-ordinate to place the text 40 graphics units *below* the top of the work area. A similar approach is adopted for drawing the circle, but here an offset of 400 graphics units is used to place the graphic well below the text.

At this point it will be worth experimenting with PROCdraw. Try altering the colours and positions of the items, and writing your own text. If you replace TIME$ with a piece of text of forty or more characters in length you will discover that the right-hand end of it is irretrievably lost. Although the window will scroll to the right, it will not scroll far enough for the end of the text to be visible, and text does not automatically drop down on to the next line as it does when printing on a normal screen or in a text window (with VDU4 active).

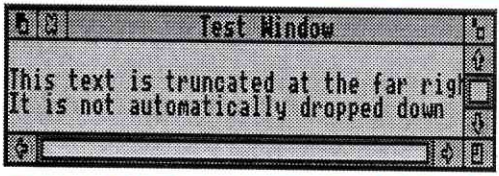

Figure 3. Text which extends beyond the edge of the work area is truncated

In other words, if you are using the Wimp, you cannot get text on to the screen by simply executing a series of PRINT statements. You need to go about the whole process with a great deal of care. Each PRINT statement must be preceded by a MOVE statement, and the length of each line of text must be less than the width of the work area.

Moreover, if you have an application which generates some text as its output, you cannot always PRINT this to the screen the moment that the information becomes available, because you must have a way to refresh as much of the screen as the Wimp requires *whenever* the Wimp requests it. Thus if you are writing a Cross Referencer say, which displays the names of functions and procedures in a program file which has been dragged to it, you must actually write your findings to a buffer area in RAM within the task program rather than printing them in the first instance; and then implement a routine to display the contents of the buffer whenever a redraw request is received. The point being that you cannot implement a new search (for procedures etc.) *each time* the Wimp needs to redraw the display. This problem will of course occur in many different kinds of applications, and its resolution will add a level of complexity to all such programs.

Although we have filled our allocated space this month, we have not quite finished the theme of window redrawing. Next month we will look at how to force a window to be updated in order to display new information.

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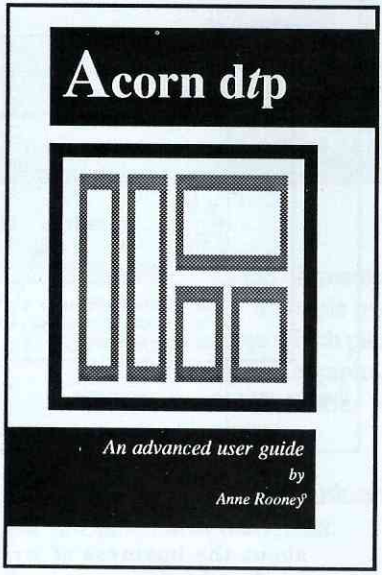

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Under the Lid

Part 4

David Spencer concludes his look at the Archimedes' hardware.

So far in this series, we have looked at the ARM processor itself, the memory, and the video and sound systems. The one major area we have yet to examine is the peripheral circuitry, such as the keyboard, disc interface and serial port.

THE IO CONTROLLER

All peripheral Input/Output (IO) operations are either performed by, or controlled by, the fourth chip in the ARM chip-set - IOC - which provides an interface between the rest of the ARM chip set and standard peripheral controller chips such as the floppy disc controller and the serial controller. To understand what IOC does, we need to look at the problems of accessing peripheral devices. In general, each peripheral system (floppy disc, hard disc, serial port, etc.) is controlled by an off-the-shelf chip designed for that particular interfacing operation. Unfortunately, as these interface chips are not designed specifically for use with the ARM, they do not dovetail into the system in the same way that MEMC and VIDC do. Furthermore, these devices have to interface with the 'outside world', and as external events can occur at any time, they cannot be guaranteed to be synchronous with the operation of the ARM processor. To overcome this problem, a system has to be adopted by which the operation of the ARM is frozen each time an IO access is made (by holding the ø2 clock high), until the peripheral device signals that it has completed the access.

A further twist to the story is that as an IO access can last an arbitrarily long time, it must be possible to perform a DMA cycle in the middle of it, as described last month, otherwise effects such as flickering on the screen would be seen. For this reason, the peripheral controllers have to use a separate data bus from the ARM processor, so that an IO operation can continue during a DMA transfer. Latches are used to hold the data for the IO operation. Figure 1 is a block diagram showing the arrangement of IOC.

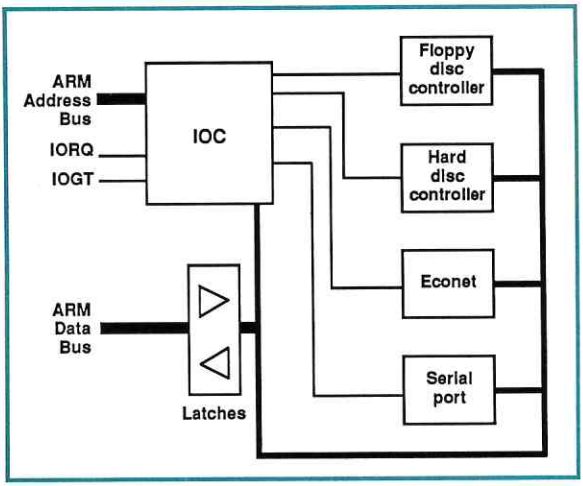

Figure 1. Highly simplified block diagram of IOC and peripheral circuits

To achieve all this, MEMC asserts a signal called IORQ (IO Request) whenever an access is made to an IO device. MEMC then waits until the IO device asserts another signal, IOGT, to announce that the operation is complete. All this, though, is far too complex for the average peripheral controller chip, and hence IOC performs the necessary operations automatically. However, to do this, IOC has to make assumptions about how fast the peripheral device can perform an operation. To allow

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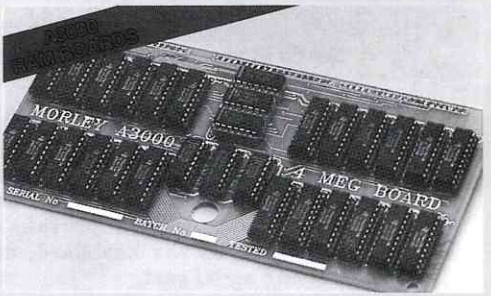

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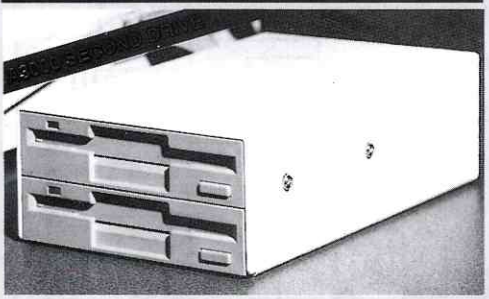

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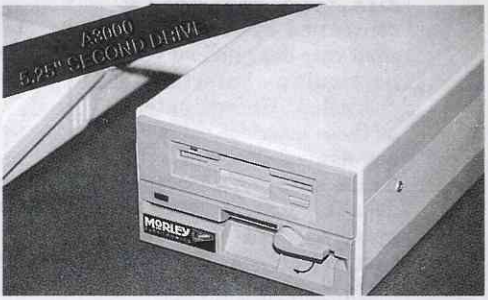

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this, IOC can perform any peripheral access at one of four different speeds. Three of these are *fast*, *medium* and *slow* which simply wait a fixed time after the start of the operation before asserting IOGT. The final access method is called *Sync*, and synchronises the access to a 2MHz clock signal. This method is compatible with many peripheral controller chips designed for connecting to the 6502 micro-processor used in earlier Acorn computers.

IOC also provides a number of internal IO devices. In particular, there is a very simple serial port that is used to transfer data to and from the keyboard. The keyboard itself contains its own processor which is used to control the other end of the serial link and scan the keyboard. IOC also contains a six-bit general purpose IO port which is used for various internal purposes such as muting the internal speaker and monitoring the acknowledge signal from the printer. Some other features of IOC are described later.

THE IO MEMORY MAP

All we have so far looked at are the basics of IO accesses, but not at how the ARM processor actually performs them. In fact, IO devices appear to the processor as memory locations, and are accessed using the STR and LDR instructions. Referring back to the ARM system memory map given in the second article in this series, the 4Mbytes of address space between address &3000000 and &3400000 is allocated to 'Input/Output Controllers'. However, in the Archimedes, only the top half of this is used to access IOC, while the bottom half is left free.

IOC further splits its allocation into four chunks which are identical except for access speed (Fast, Medium, Slow or Sync). This allows the speed of an access to be determined by the address used for the access. Each chunk is further split into eight blocks, each 64K in length. The first block is used to access registers internal to IOC, while the others are allocated to different peripheral controllers. Figure 2 sums up the situation.

Address	Type	Bank	IC	Use
&3240000	Slow	4	--	Internal Expansion cards
&3270000	Slow	7	--	External Expansion cards
&32C0000	Med	4	--	Internal Expansion cards
&32D0000	Med	5	HD63463	Hard Disc register write
&32D0008	Med	5	HD63463	Hard Disc DMA read
&32D0020	Med	5	HD63463	Hard Disc register read
&32D0028	Med	5	HD63463	Hard Disc DMA write
&3310000	Fast	1	1772	Floppy disc controller
&3340000	Fast	4	--	Internal Expansion cards
&3350010	Fast	5	HC374	Printer Data
&3350018	Fast	5	HC574	Latch A
&3350040	Fast	5	HC574	Latch B
&33A0000	Sync	2	6854	Econet controller
&33B0000	Sync	3	6551	Serial port controller
&33C0000	Sync	4	--	Internal Expansion cards

Figure 2. Addresses of peripheral devices

The *internal expansion* area is where so-called podules are mapped, and *external expansion* is available for extra podules that can be added outside the computer. The IC column indicates the device numbers of the individual peripheral controller chips, and you can find more details of these by referring to the chips' data sheets (available from component suppliers). The type column shows the access speed, while the bank number refers to the block as decoded by IOC. The two latches (Latch A and B) are used to control various features of the floppy disc system, such as which drive to use.

A very important point to note here is the *width* of the data bus used for peripheral devices. Remember that the ARM itself uses 32-bit words, and hence

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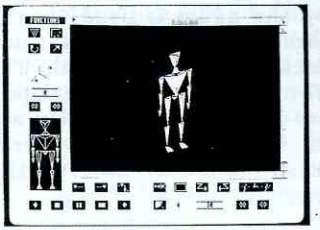

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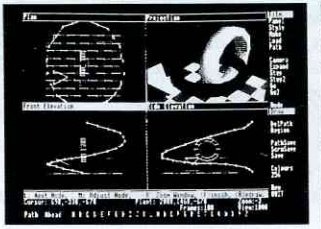

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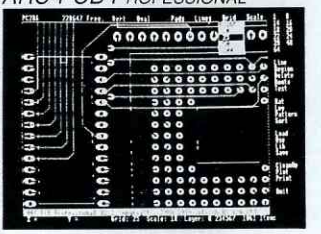

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the addresses of two adjacent words in memory differ by a value of four (because the address is always specified in terms of eight-bit bytes). Processors that use 32-bit data buses are all relatively new, and almost all the available IO controllers work with either eight or sixteen-bit buses. Indeed, IOC limits devices to using an eight or sixteen bit bus. On the Archimedes, the HD63463 Hard Disc Controller is a sixteen-bit device, while all the others use eight bits.

A final point to make is that all of the IOC address space is protected against being accessed when the processor is in user mode. Therefore all accesses to IO devices must either be made from interrupt code or within a module, unless a short program is used to enter supervisor mode prior to the transfer.

INTERRUPTS

Imagine what has to happen when a program is running, and the user presses a key on the keyboard. This keypress is passed back to IOC, and in some way the operating system must take note of it. However, because a program is running, the operating system cannot look at IOC constantly to catch each keypress. Instead, a technique known as an *interrupt* is used. What happens is that when a key- press is received by IOC, it sends a signal known as an interrupt request (IRQ) to the ARM processor. On receipt of the IRQ signal, the operating system suspends execution of the program (after completing the current instruction) and jumps to a routine to read the key press and store it for later. When this has been done, execution of the original program is resumed. The entire interrupt process takes only a few microseconds, and the main program is oblivious to the fact that the interrupt has occurred.

Interrupts constitute a very powerful technique when the operating system is required to respond to events which happen asynchronously with any program being executed. As this applies to most IO operations, IOC makes extensive use of interrupts.

There is a second level of interrupt known as the Fast Interrupt (FIQ). These are similar to the normal IRQs, but are guaranteed a quicker response from the ARM processor. For this reason, FIQs are only used when speed is of the utmost importance. For example, for data transfers by the floppy disc controller and Econet interface.

Whenever an IRQ or FIQ occurs, IOC keeps a note of the source of the interrupt. When the ARM processor responds to the interrupt, RISC OS can interrogate IOC to find out the source and act accordingly.

TIMERS

Contained within IOC itself are four timers, which are basically counters that can be loaded with a particular value, and then decremented at a constant rate. Each time a timer is decremented through zero, it generates an interrupt. Of these timers, two have dedicated hardware uses - one generates the baud rate clock for the serial link to the keyboard, and the second is used to generate the receive baud rate for the serial port when using split speeds. This is necessary as the serial interface chip can only generate a single baud rate internally. A third timer is used by RISC OS to generate an interrupt every hundredth of a second. This is used to control tasks such as keyboard auto-repeat, as well as updating the value of the pseudo-variable TIME. The final timer is free for the user's own program.

THE IIC BUS

A final method of accessing peripheral devices employed on the

continued on page 61

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Hints & Tips. . . Hints & Tips

PRINTER DRIVERS AND Alias$@PrintType

Lee Calcraft

When a file is dragged to a printer driver, exactly what happens depends on the file type of the dragged file. The driver software first checks the printer aliases to see if there is an alias for the particular file type - for example:

```
Alias$@PrintType_FF9
```

You can display these by typing *SHOW. But note that none is set by default.

Printer aliases usually take the form: Alias$@LoadType_nnn<application> -print where nnn is the file type, and <application> is the application name (together with directory path).

If the printer driver finds the required print type, it will run the nominated application (loading it if it is not already installed), and request that it prints the file. The application will then typically dialogue with the driver to print the file. In the case of a sprite for example (i.e. type FF9), dragging a sprite icon to a printer driver will cause Paint to be loaded, and routines from Paint will then be used to print out the sprite by making calls to the printer driver.

Printer aliases are usually set up in the !Boot files of an application, so that they are known to the system as soon as a directory viewer containing the application is opened. But if no alias is found for a particular file type, the user receives the message: "I don't know how to print Sprite files; do you want me to print your file as plain text?". The exception to this is files of type ASCII (FFF), which are printed as a straight text file.

SYNTAX ERRORS FROM SYSTEM FONTS

Lee Calcraft

If you install a new system font which uses the same shaped character for an "O" as for a zero (or if you just redefine the zero character to match the "O"), you will get syntax errors if you use cursor editing on a Basic program. This occurs because in cursor editing, Basic reads characters directly from the screen, and will read both zeros and "O"s as zeros, though you will not realise this until you re-run your program. In those circumstances, copying:

```
FOR A=1 TO 10
```

will give you

```
FOR A=1 TO 10
```

PRINTING THE LAST LINE

Alan Wrigley

Printers are strange creatures sometimes and one little quirk that fools some people is that a line of print will not be printed unless it is followed by a linefeed or carriage return, or the printer is taken off-line. This can result in graphics dumps, for example, appearing to ignore the last line. If this happens, simply press the button which takes the printer off-line, and hey presto, the last line will be printed.

RETURN TO DESKTOP

Alan Wrigley

If you have used F12 from the Desktop in order to access the command line interpreter, it may not be immediately obvious how to return to the Desktop. You might think that typing *Desktop will do the trick, but in fact all you will get is a blank window on the screen. The correct way to return is simply to press Return at the * prompt, which will drop you back into the Desktop.

IF-THEN

C. J. Hayes

Into the Arc (Volume 2 Issue 9) stated that it is a matter of personal preference whether to include the THEN statement in an IF-THEN construct. There is, however, one circumstance in which it must be included, and that is when a star command follows immediately after. For example, the line

```
IF X=10 *FX3
```

would generate an error because the Basic interpreter would confuse the star command with a multiplication symbol, and search for a variable called FX3.

PRINT TAB
Alan Wrigley

If you specify only one parameter in a TAB statement, e.g. PRINT TAB(10), the data which follows will be printed starting at column 10 of the line that the cursor is currently on, unless the cursor is already beyond that position, in which case it will move to column 10 of the next line. The result is exactly the same if you are sending the data to a printer.

However, using two parameters, e.g. PRINT TAB(20,15), defines a specific position on the screen, i.e. line 15 column 20. The cursor will move to this position irrespective of where it was previously, but with a printer this will simply be ignored, as the print head cannot move up and down at random.

This is all fine if you know exactly where on the screen the output is to appear. But what if you don't know where the cursor is at present but you want to move it to a particular position on, say, the previous line? A simple way to do this is to determine the current line with VPOS, and use this as the basis for the parameters, e.g. PRINT TAB(20,VPOS-1).

DISC FORMATS
Tom Johnson

If you back up a D format disc onto an E format one, the backup disc reverts to D format. As a result, if you have a number of old D format discs and wish to convert them to E format it is a laborious task to transfer them all directory by directory if you only have a single drive. A quicker method is to use the Fast Directory Copier (RISC User Volume 1 Issue 6) to copy the root directory, together with all its sub-directories, onto a newly E formatted disc. This is a little slower than backing up but a lot faster than copying individual files and directories using a single drive.

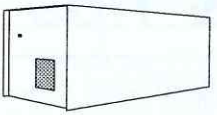
RU

Under the Lid (continued from page 57)

Archimedes is a system known as the IIC bus (read "I squared C"). This is a specialised bus that was developed by Philips, and is unusual in that it is a serial bus. This means that data is transferred bit by bit, rather than byte by byte or word by word, therefore making the bus relatively slow. However, the IIC bus has the advantage that far fewer lines are needed. In fact, only two connections are used - the serial data itself (labelled SDA) and a clock to synchronise the transfers (SCL). These lines are connected to two bits of the general purpose port on IOC.

Because of its lack of speed, the IIC bus has limited use, and is only used to communicate with the real-time clock and CMOS RAM chip. However, the SDA and SCL signals are also made available to podules, and can be used by them. It is also relatively complicated to control the bus, because of the complex timings needed between the two signals. Luckily, though, RISC OS provides the SWI call "IIC_Control" to do the job for you.

That brings us to the end of this series, and I hope that it has been interesting. Unfortunately, it is such a vast subject that we have only been able to scratch the surface, but I hope that it has provided an overview of what is happening within the Archimedes. RU



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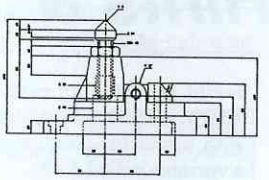

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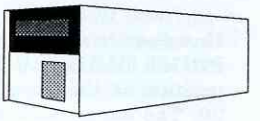

Available from mid-December, Oak SCSI Tape Streamers provide the ideal means of backing up data from SCSI or ST506 winchesters, networks or indeed any filing system. Desktop software allows files for backing up to be easily specified, and data can be saved and restored on a file by file basis. Add £100 if you do not have a SCSI card. *p&p £15.00*

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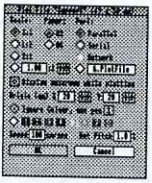

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Postbag

NOT A COMPETITION

This is NOT a competition entry, but you might be interested in the expression:

$$\frac{\text{LOG}\left(\frac{\text{LOG}(4)}{\text{LOG}(\sqrt{\sqrt{....\sqrt{4}}})}\right)}{\text{LOG}\left(\frac{\text{LOG}(4)}{\text{LOG}(\sqrt{4})}\right)}$$

It evaluates to an integer equal in value to the number of square root signs on the second (of the four) lines, including zero (though limited to 30 by the accuracy of Basic V). The four fours may be replaced by four of any positive number, except 1, not necessarily integers.

C.R.J.Singleton

THE GREAT PRINTER CONSPIRACY

Why is it that reviewers and other writers in your magazine are obsessed with 24-pin impact dot-matrix and laser printers? 24-pin printers are very nice, but not so good for DTP applications, and the notion that you can rush out and buy laser printers is laughable. You seem to be ignoring a type of printer which falls neatly inbetween.

I refer to the inkjet dot-matrix printers, which seem to have been complete ignored apart from the slow colour-only Integrex 132, and that has been around for five years or so.

I use a Hewlett-Packard DeskJet-Plus, available from various dealers, for which I paid £499 plus VAT. You get a printer with 300 dpi resolution, which produces quality very close to that of a laser printer with ordinary cheap typing paper. And Hewlett-Packard throw in a year's next-day-response on-site maintenance as part of the warranty. The LaserJet printer driver supplied by Acorn works fine with the DeskJet.

So please, let's have a review of this versatile printer very soon.

Richard Sterry

As we hinted in last month's article ***On Printers, Drivers and Fonts****, we will be taking a look at the DeskJet in a forthcoming issue. As Mr. Sterry notes, it appears to represent an excellent low cost alternative to the laser printer.*

RISC USER SPECIAL DISC AND RISC OS

Now that I have the new RISC OS system fitted to my Arc, I find that the RISC User Volume One Special Disc does not function. Can you please advise me?

Ernest Swift

The RISC User Volume One Special Disc was released on the first anniversary of the launch of RISC User. It contained the first version of ArcScan with the index for volume one of RISC User, a number of utilities, and a highly effective visual demonstration. The Special Disc will work under RISC OS, but must be started by pressing Shift-Break as it is not designed to be run from the Desktop. The only possible sources of errors are inappropriate configuration settings, particularly with regard to ScreenSize and SpriteSize. If these are adjusted (with the Task Manager) to 160K and 16K respectively then all should be well.

The disc itself is no longer available, having been superseded (partly) by ArcScan II and the RISC User Toolbox. These products both provide superior and extended versions of the relevant software.

FOR SOME THE WEEK STARTS ON SUNDAY

What changes should be made to your RISC User Desktop Diary to display the calendar with the days in the order SMTWTFS, instead of the MTWTFSS order as listed?

Nobilangelo Ceramalus

The changes needed are as follows. Modify the two lines from part one shown below:

```
   2270   ... -2+D%)MOD7
to:       ... -1+D%)MOD7
   3440   ... "Mon Tue ... Sun"
to:       ... "Sun Mon ... Sat"
```

and in part two of the program:

```
   3340 day$()="Monday", ... ,"Sunday"
to: day$()="Sunday", ... ,"Saturday"
```

RU

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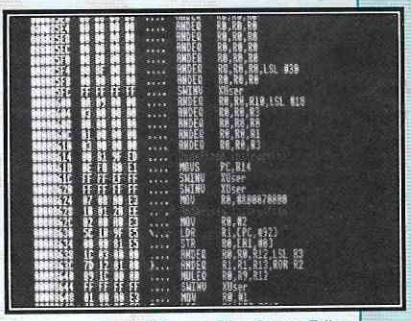

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Technical Queries

Dear Sir,

*With regard to memory allocation under RISC OS, I find that some programs lock away memory in the module area, and the only way I have found to get it back is to do a hard reset. Examination of the area using *ROMModules does not show any difference, yet a block of memory has been gobbled up and not returned when the application has been removed. Where has the memory gone, and can you get it back without a hard reset?*

Also on memory, I have tried to get the MemAlloc program working, but as yet I have not been successful. How do you do it?

Peter Foster

The memory which has been 'lost' in the RMA (relocatable module area) has not been taken by any application but by any modules required by the application (e.g. the floating point emulator). These modules are not removed when the application terminates. In order to recover any memory lost in this way, type:

```
*RMCLEAR
```

at the command line (the star prompt) to kill off all relocatable modules in RAM. Then activate the Task Manager and drag the *Module Area* bar to the left to reduce the memory allocation. However, do NOT do this if there are any applications installed. If necessary, the alternative command *RMKill <module name> can be used to remove individual modules by name. Incidentally, the *ROMModules command will not list any modules which are in the RMA; it only lists those in ROM. Use instead the *Modules command.

As for the MemAlloc module (first described in RISC User Volume 2 Issue 8 p59), once it has been loaded then the sizes of various memory areas can be changed using star commands. For example, typing:

```
*ScreenSize 160
```

would set the screen size to 160K. For more details type:

```
*Help MemAlloc
```

once the module has been loaded.

Mike Williams

Dear Sir,

I have a multi-sync monitor. When I change to high resolution modes the width of the image shrinks about 15% (from the right). How can I preserve the 'normal', i.e. mode 12, aspect ratio across all modes?

Nobilangelo Ceramalus

There are two points at issue here. As far as shrinkage of picture image is concerned, this is a function of the monitor being used. The Taxan 770 multi-sync monitor, which is recommended for use with the Archimedes, has a number of pre-set controls which can be adjusted to ensure that the picture fully fits the screen in the multi-sync modes. Other makes of monitor may or may not provide for such adjustments.

Secondly, in any of the multi-sync modes (modes 18 to 21) the screen displays 64 rows of 80 characters each, instead of the 32 lines of 80 characters in mode 12, for example. Thus it is impossible to preserve the aspect ratio as far as text is concerned. However, for graphics the screen area is always addressed as 1280 points horizontally by 1024 points vertically (except modes 16, 17 and 24) and thus the aspect ratio remains constant across all except these modes, but the number of colours and screen resolution changes. For example, mode 12 provides 16 colours with a graphics resolution of 640 by 256, while mode 20 (a multi-sync mode) provides a resolution of 640 by 512 also in 16 colours. In the multi-sync mode the higher resolution leads to a better quality screen image, which in turn permits the use of twice the normal number of rows of text.

Mike Williams RU

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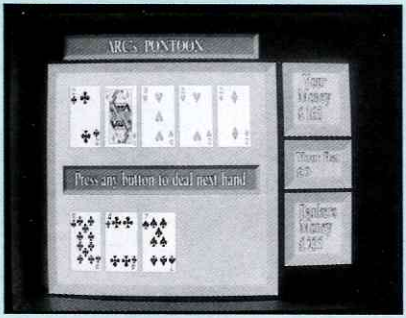
RISC USER MAGAZINE DISC CONTENTS



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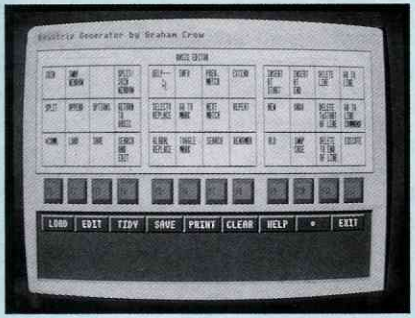
Programmer's Reference Manual

The contents of three pages which were omitted from the Programmer's Reference Manual.

ArcScan Data

This month's ArcScan data files.

Plus the following programs from RISC User magazine:



Setting Filetypes

A very useful utility which allows you to set the filetype of files directly from the Desktop.

Mastering the Wimp (Part 5)

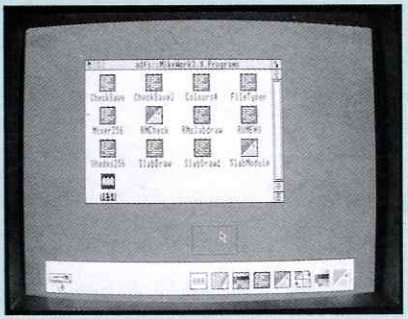
A program illustrating the problems connected with the creation of windows for displaying text.

Coloured Text Panels

A module for creating three dimensional coloured slabs for text displays.

A Check Save Module

A short utility which prevents you from overwriting files by offering a prompt if a filename already exists.



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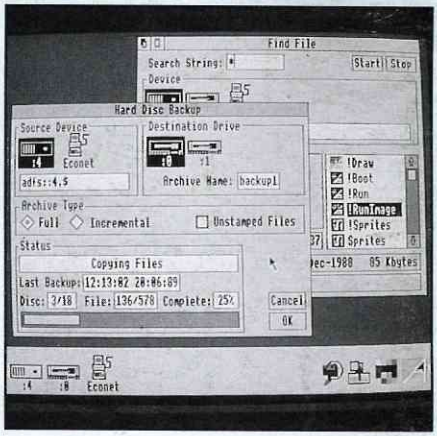

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Spark - File Archiver

Spark is an archiving program used to create and maintain file archives. It is entirely WIMP based, with the contents of an archive displayed in a similar way to an ADFS directory. Files may be dragged directly from a directory into the archive, or vice versa. An important feature of **Spark** is that it automatically compresses the files being archived. **Spark** is very easy to use, and has many uses. For example, you could put 2MB (or more!) of sprites onto an 800K floppy disc. Then, to load a sprite into ArcPaint, simply drag it from the archive - it will be decompressed automatically. **Spark** has many powerful features, and is compatible with the public domain archiver, **Arc**.

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Find File is a fast, easy-to-use utility for locating files on hard disc, floppy disc and Econet. **Find File** runs from the multi-tasking Desktop environment, so it can be left to search for a file while you do other things. As well as finding individual files, **Find File** can locate files that match a wildcarded search string, or that have a specified filetype. Once a file has been located, **Find File** can give full information about a file including its filetype, length, and pathname. In addition, you can open a directory viewer on the file so that it can be easily loaded, executed, deleted etc.

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